Screwworm
Puerto
Rico

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL HEALTH DIVISION
FEDERAL CENTER BUILDING
HYATTSVILLE, MARYLAND 20782

November 4, 1969

Subject: Dr. J. Maldonado C.

To: B. G. Hightower
Entomologist in Charge
Entomology Research Division
Mission, Texas 78572

This refers to our telephone conversation of October 9, 1969, about Dr. Maldonado's interest in a possible screwworm eradication program in Puerto Rico. Enclosed are two letters to Dr. Maldonado. I am sure Dr. Maldonado would appreciate having any information on screwworm fly attractants that you would care to pass on to him.

Dr. John L. Wilbur, Assistant Director, Southeast Region, ANH, has requested that copies of all correspondence to individuals in Puerto Rico be sent to Dr. Oren L. Kelsey, Veterinarian in Charge, GPO Box 3488, San Juan, Puerto Rico 00936. Dr. Kelsey is coordinating the screwworm effort in Puerto Rico and this method would help keep him informed.

Donald L. Williams
Chief Staff Veterinarian
Screwworm Eradication

2 Enclosures

cc:
C. Schmidt, Beltsville, Md.
O. L. Kelsey, San Juan, P.R.
S. C. Gartman, Mission, Tex.
J. L. Wilbur, Hyattsville, Md.

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HYATTSVILLE, MARYLAND 20782

November 4, 1969

Subject: Dr. A. Maldonado C.

To: R. G. Hightower
Entomologist in Charge
Entomology Research Division
Mission, Texas 78572

This refers to our telephone conversation of October 3, 1969, about Dr. Maldonado's interest in a possible screworm eradication program in Puerto Rico. Enclosed are two letters to Dr. Maldonado. I am sure Dr. Maldonado would appreciate having any information on screworm fly eradication that you would care to base on his.

Dr. John L. Wilder, Assistant Director, Southeast Region, ARS, has requested that copies of all correspondence to individuals in Puerto Rico be sent to Dr. Oren L. Kelley, Veterinarian in Charge, GPO Box 3482, San Juan, Puerto Rico 00936. Dr. Kelley is coordinating the screworm effort in Puerto Rico and this action would help keep him informed.

Donald L. Williams
Chief, Staff Veterinarian
Screwworm Eradication

2 Enclosures

cc:
C. Schmidt, Beltsville, Md.
O. L. Kelley, San Juan, P.R.
R. C. Gerwek, Mission, Tex.
J. L. Wilder, Southeastern Region

Screwworm
Puerto Rico

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL HEALTH DIVISION
FEDERAL CENTER BUILDING
HYATTSVILLE, MARYLAND 20782

October 26, 1970

Subject: Defoliants

To: Donald W. Johnson
USDA Liaison Officer
Ft. Detrick, Frederick, Md.

We need 50 grams each of samples of agent orange, agent white, and agent blue. We would appreciate it if you would obtain this material for us. It will be used in screwworm toxicity studies by Entomology Research Division at Mission. We need to know whether aircraft which contain residues of these agents would be safe to use in fly release activities. This information is required as part of our preplanning for a possible screwworm eradication program in Puerto Rico.

Norvan Meyer
Senior Staff Veterinarian
Emergency Animal Diseases

Insects Affecting
Man & Animals
OCT 27 1970
C.H.S.
R.H.H.
J.A.P.

cc:
J. Fluno, ENT, Belts.
S. C. GArtman, Mission
R. L. Evinger, VIC, Puerto Rico
E. J. Wilson
J. L. Wilbur

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Norman Meyer
Senior Staff Veterinarian
Emergency Animal Diseases

cc:
J. Flumo, ENT, Belts.
S. C. Gartman, Mission
R. L. Evinger, VIC, Puerto Rico
E. J. Wilson
J. L. Wilbur

U.S. DEPARTMENT OF AGRICULTURE

REFERENCE SLIP

DATE 10/21/70

TO

Mr. J. Fluno

Insects Affecting Man & Animals

ENT, Belts.

- [ ] ACTION
- [ ] NOTE AND RETURN
- [ ] APPROVAL
- [ ] PER PHONE CALL
- [ ] AS REQUESTED
- [ ] RECOMMENDATION
- [ ] FOR COMMENT
- [ ] REPLY FOR SIGNATURE OF
- [ ] FOR INFORMATION
- [ ] RETURNED
- [ ] INITIALS
- [ ] SEE ME
- [ ] NOTE AND FILE
- [ ] YOUR SIGNATURE

done

REMARKS Mr. Fluno please destroy the copy of the Colonel Naylor letter sent to you Oct. 5. This letter was rewritten and a copy of the final is enclosed.

FROM

Dr. Williams (cjm)

ANH, Hyatts.

Mr. J. Flynn

Insects Affecting Man & Animals

DMT, Belize.

Mr. Flynn please destroy the copy of the Colonel Taylor letter sent to you Oct.5. This letter was rewritten and a copy of the final is enclosed.

Dr. Williams (cjm)

ADD, Byatts.

Screwworm
Puerto Rico + Virgin Island

OCT 19 1970

Colonel Robert Naylor
Headquarters, USAF (XOOSO)
Washington, D.C. 20331

Dear Colonel Naylor:

It is possible that we may enter into a cooperative screwworm eradication program with Puerto Rico and the Virgin Islands. The United States Air Force proposed to the Secretary of Agriculture in July of 1967 (Coronet Roundup) that they furnish aerial support for this effort. If Congress approves such a program we would like to start operations without delay. We understand that some of your development work on fly release devices has not been completed. If you wish to continue this work, our people at Mission, Texas, will be pleased to give the Special Operations Force any assistance they require.

We appreciate the interest that the Special Operations Force has shown in the screwworm program and hope that we can continue to work together in beneficial programs of mutual interest.

Thank you for your cooperation.

Sincerely,

Oct. 21, 70
Shown to Dr. Evinger

R. E. Omohundro
Acting Director

cc:
R. L. Evinger, VIC, Puerto Rico
J. L. Wilbur, ANH
Lt. Col. Dan Mosely, Eglin AFB
E. P. Knipling, Belts.
J. Fluno, Ent, Belts.

This is the letter that went out — Sine — mistake

Rewritten: (First letter signed by Dr. Sharman, but never went out).
ARS:ANH:DLWilliams:WRoss:cm 10/16/70

Screwworm

Entomology Research Division
P. O. Box 986
Mission, Texas 78572

July 26, 1971

Subject: Collection of Egg Mass and Fly Trapping Data in Puerto Rico

To: Dr. Donald L. Williams

I strongly recommend the continuation of all efforts to maintain as many test pens and fly traps as possible in Puerto Rico during this phase of the eradication effort.

It will be very difficult to evaluate the progress of the program without these data.

Billie G. Hightower
Entomologist in Charge

cc
S. C. Gartman
R.O. Drummond
C. H. Schmidt

Entomology Research Division
P. O. Box 986
Mission, Texas 78572

July 26, 1971

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Screwworm

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL HEALTH DIVISION
FEDERAL CENTER BUILDING
HYATTSVILLE, MARYLAND 20782

Insects Affecting Man & Animals
AUG 16 1971
J.A.F.

AUG 16 1971

Dr. R. C. Bushland
Entomology Division
Metabolism and Radiation Research
Laboratory
State University Station
Fargo, North Dakota 58102

Dear Dr. Bushland:

We plan to hold a meeting in San Juan, Puerto Rico, on August 25 and 26 to discuss the screwworm eradication program in Puerto Rico and the Virgin Islands. Sterile fly releases started there on June 1 and are being continued. In the beginning, we agreed to hold a meeting every three months to discuss the status of the program.

Rancher interest has been very good. We have collected very few sterile egg masses since the program started and the weekly case incidence is holding at about 35-60 cases per week in Puerto Rico. We are disappointed with the program results so far and feel that perhaps some adjustments in the program are necessary.

Representatives of this Division, Entomology Research Division, U.S. Air Force and officials from the Commonwealth of Puerto Rico, United States' and British Virgin Islands will attend. We hope that you can come to San Juan and participate in this meeting.

Dr. Evinger, ANH Veterinarian-in-Charge, will send you additional information about this meeting.

Sincerely,

R. S. Sharman

R. S. Sharman
Director

cc:
J. L. Wilbur, ANH, Hyattsville, Maryland
B. G. Hightower, Mission, Texas
C. H. Hoffman, Beltsville, Maryland
R. L. Evinger, VIC, Puerto Rico
Major R. Pyatt, USAF, Pentagon
C. H. Schmidt, Beltsville, Md.

UNITED STATES DEPARTMENT OF AGRICULTURE
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ANIMAL HEALTH DIVISION
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AUG 16 1971

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Laboratory
State University Station
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Dr. Eslinger, ARS Veterinarian-in-Charge, will send you additional information about this meeting.

Sincerely,

E. S. Shannon
Director

cc:
J. L. Wilbur, AMH, Hyattsville, Maryland
B. C. Hightower, Mission, Texas
C. H. Hoffman, Belleville, Maryland
R. L. Eslinger, VIC, Puerto Rico
Major K. Pyatt, USAF, Pentagon
C. H. Schmidt, Beltsville, Md.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL HEALTH DIVISION
FEDERAL CENTER BUILDING
HYATTSVILLE, MARYLAND 20782

Subject: Screwworm Program Meeting -- Puerto Rico

To: Dr. J. L. Wilbur
Assistant Director

The following ARS personnel will attend the screwworm eradication program meeting in San Juan, Puerto Rico, on August 25-26:

1. Dr. R. C. Bushland
2. Dr. J. L. Wilbur
3. Dr. Norvan Meyer or Dr. D. L. Williams
4. Dr. Floyd Smith
5. Dr. M. E. Meadows, Jr.
6. Mr. Jack Graham
7. ANH personnel stationed in Puerto Rico designated by Dr. Evinger to attend

Please have Dr. Evinger obtain hotel reservations for this group.

Dr. Bushland will arrive in San Juan on Pan American Airlines flight #254 on Sunday, August 22. He desires to visit test pens, fly traps, and look over the area prior to the meeting.

R. S. Sharman
Director

cc:
E. F. Knipling, NAL, Beltsville, Md.
R. C. Bushland, Fargo, North Dakota
B. G. Hightower, Mission, Texas
M. Mixson, Acting Assistant Director
R. L. Evinger, VIC, Puerto Rico
G. H. Schmidt, Beltsville, Md.
E. J. Wilson, Assistant Director
H. C. Cox, Entomology Research
Major Robert Pyatt, USAF

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Director

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R. C. Bushland, Fargo, North Dakota
B. G. Hightower, Mission, Texas
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R. L. Evinger, VIC, Puerto Rico
G. H. Schmidt, Beltsville, Md.
E. J. Wilson, Assistant Director
H. C. Cox, Entomology Research
Major Robert Pyatt, USAF

Screwworm
Puerto Rico

Entomology Research Division
P. O. Box 986
Mission, Texas 78572

September 24, 1971

Subject: Cause of Failure to Reduce Screwworm Population in Puerto Rico Eradication Project

To: Dr. M. E. Meadows
Acting Veterinarian in Charge
Animal Health Division
Mission, Texas

This memorandum is a summary of the conclusions and recommendations made by members of this laboratory at the ENT-ANH conference held on September 23 on the above subject.

Three factors were proposed for consideration as possible sources of apparent biological failure in the Puerto Rico project.

(1) Liquid medium-reared vs. meat-reared flies.

Experimental data gathered in our laboratory in recent years provide no basis for concluding that flies reared in liquid medium are inferior to those reared in meat medium. We do not believe that this is a factor of prime consideration in seeking a cause and effect relationship in this situation.

(2) Quality of released flies.

The stresses of transportation and maintenance may contribute to the reduced effectiveness of flies destined for release in Puerto Rico. Consideration should be given to determining if these stresses importantly reduce the quality of the flies and to taking measures to provide relief from such adverse influences.

(3) Geographical strain differences.

We have demonstrated that there are differences in the biological characteristics of screwworm flies of different geographical origin. For example, in a preliminary comparison of the plant-reared Mexico strain with this laboratory's Puerto Rico strain, the interstrain mating frequency was lower than the intrastrain mating frequency. However, the Puerto Rico strain was in a very early generation of laboratory adaptation.

Puerto Rico

Entomology Research Division
P. O. Box 984
Mission, Texas 78572

September 24, 1971

Subject: Cause of Failure to Reduce Screwworm Population in Puerto Rico Eradication Project

To: Dr. M. E. Meadows
Acting Veterinarian in Charge
Animal Health Division
Mission, Texas

This memorandum is a summary of the conclusions and recommendations made by members of this laboratory at the PRE-ARS conference held on September 23 on the above subject.

Three factors were proposed for consideration as possible causes of apparent biological failure in the Puerto Rico project.

(1) Liquid medium-reared vs. meat-reared flies.

Experimental data gathered in our laboratory in recent years provide no basis for concluding that flies reared in liquid medium are inferior to those reared in meat medium. We do not believe that this is a factor of prime consideration in causing a cause and effect relationship in this situation.

(2) Quality of released flies.

The stresses of transportation and maintenance may contribute to the reduced effectiveness of flies destined for release in Puerto Rico. Consideration should be given to determining if these stresses impertinently reduce the quality of the flies and to taking measures to provide relief from such adverse influences.

(3) Geographical strain differences.

We have demonstrated that there are differences in the biological characteristics of screwworm flies of different geographical origin. For example, in a preliminary comparison of the plant-reared Mexico strain with this laboratory's Puerto Rico strain, the interstrain mating frequency was lower than the intrastrain mating frequency. However, the Puerto Rico strain was in a very early generation of laboratory adaptation.

It is now in its 59th generation, and its mating characteristics may have changed. We suggest that new mating tests comparing the 2 strains are needed to provide data on the mating vigor of the present Puerto Rico colony. Plans have been made to obtain these data in this laboratory.

It appears, therefore, that strain differences may be a prime factor for consideration here. We recommend that sufficient numbers of flies of Puerto Rico origin be cultivated to replace the Mexico strain in current use in the Puerto Rico project. We will provide as many eggs, pupae, or both as quickly as biologically possible to enable ANH to attain a sufficient level of production to replace Mexico strain with Puerto Rico strain for release in Puerto Rico. Steps have already been taken to implement this procedure.

In addition, we recommend that collections be made in nature in Puerto Rico of screwworm flies of diverse geographical origin to be incorporated in the present ENT strain of Puerto Rico flies or to supplant it. This step is desirable in order to provide as broad a genetic spectrum as possible representative of screwworm flies found in nature in Puerto Rico. Similarly, collections should be made in Mexico for incorporation in the plant strain being reared for mainland release.

Maxwell M. Crystal
Research Entomologist
Acting in Charge

cc:
C. H. Schmidt
R. O. Drummond
G. W. Eddy
J. A. DeVaney
R. R. Grabbe

Dr. Meadows September 24, 1971

It is now in its 39th generation, and its mating characteristics may have changed. We suggest that new mating tests comparing the 2 strains are needed to provide data on the mating vigor of the present Puerto Rico colony. Plans have been made to obtain these data in this laboratory.

It appears, therefore, that strain differences may be a prime factor for consideration here. We recommend that sufficient numbers of flies of Puerto Rico origin be cultivated to replace the Mexico strain in current use in the Puerto Rico project. We will provide as many eggs, pupae, or both as quickly as biologically possible to enable ARS to attain a sufficient level of production to replace Mexico strain with Puerto Rico strain for release in Puerto Rico. Steps have already been taken to implement this procedure.

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Maxwell M. Crystal
Research Entomologist
Acting in Charge

cc:
C. E. Schmidt
E. O. Dressend
G. W. Eddy
L. A. DeVenny
E. K. Crabbe

Claude Schmidt
Screwworms
Puerto Rico

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
METABOLISM AND RADIATION RESEARCH LABORATORY
STATE UNIVERSITY STATION
FARGO, NORTH DAKOTA 58102

September 30, 1971

Subject: Puerto Rican screwworms

To: H C Cox, Director
Entomology Research Division, ARS, USDA
Plant Industry Station
Beltsville, Maryland 20705

In a special package I am sending today to Dr. Crystal one pint of a mixture of 1 part glacial acetic acid and 3 parts 95% ethanol prepared by Dr. Riemann. I would like to have him fill a few specimen vials with this solution for Mr. Graham to take to Puerto Rico.

Since I had two telephone conversations with Dr. Williams and one telephone conversation with Mission, I take this opportunity to record my understanding of our agreement.

Dr. Williams told me that Mr. Graham had noted departures from our idea of normal, wild-type, American screwworms in examining eggs in Puerto Rico. He found that the Puerto Rican eggs were smaller and somewhat different structurally. At the time of our visit to Vieques, Mr. Graham and I had noted in a casual examination of 5 vials of recently collected larvae that they lacked the two most prominent field identification characteristics. The larvae did not have the pinkish color common to grown screwworms and the tracheal trunks did not have the characteristic black pigmentation. Subsequently those larvae were identified by Mr. Gerrish as screwworms and the specimens trans-shipped to me for further examination. I examined the larvae from 2 vials of the shipment, and Dr. Riemann studied larvae in all 5 vials. We found other departures from standard characteristics. The anterior spiracle in American screwworms has an average of 8 lobes with a range of 6 to 11. We found that larvae in 3 vials fit this description, but in 2 other vials the lobes numbered as high as 14. Also the standard pattern of spines on the 11th abdominal segment is that the band is interrupted dorsally with an absence of spines. We found that the larvaein some vials fitted this characteristic, but in 2 vials the bands were continuous. These physical variations in what are variable characteristics even in North American specimens suggest that Puerto Rican screwworms are quite different from North American screwworms.

Dr. Williams told me over the telephone that because of the remarkably poor field results so far noted in Puerto Rico as well as the physical differences noted in specimens collected there, Dr. Crystal and Mr. Graham had proposed extensive new collections of Puerto Rican screwworms and establishing a new colony of these flies at Mission as a breeding stock for the production of a Puerto Rican strain of sterilized flies to be released. Dr. Williams asked my opinion of the proposal.

I told Dr. Williams that I would be afraid to establish such a colony at the Mission plant for fear of escape of the flies. I said that I thought that Mission had done a wonderful job of fly security throughout its operation but that present procedures of releasing massive numbers of sterile Mexican strain flies to mate with any that might escape the stringent security procedures might not suffice for Puerto Rican flies. If the Puerto Rican flies are sexually isolated so that those females either do not attract or refuse to mate with American males, then any escape might result in the establishment of a new strain of fly which we could not combat with our existing stocks. Until we have the experience, we cannot say whether a new strain of Puerto Rican flies would lend itself to our established mass production procedures. Therefore, I recommended that the Puerto Rican flies not be brought to the United States.

My suggestion was that any research on the biology of Puerto Rican screwworms should be done in Puerto Rico and that it would not be terribly expensive to set up a small laboratory for 1 or 2 scientists and a couple of assistants in Puerto Rico. I said that something on the scale of what Entomology Research did at Orlando, Florida, before the eradication program there should suffice to investigate the biology, and if it would prove necessary, produce enough sterile flies for the Puerto Rican eradication program. Dr. Williams said that the big objection to my proposal was lack of funds. I said that I did not want to be obstructionist and suggested that he call Dr. Knipling.

Dr. Williams called me back later in the afternoon and said that Dr. Knipling expressed general agreement with my fears but thought that a small colony could be safely confined in the Entomology Research facilities at Mission where Dr. Crystal and his staff could exercise extreme caution. Dr. Knipling proposed that the Entomology Research staff do varied tests to investigate this Puerto Rican strain and then probably destroy it at the conclusion of the investigation. I told Dr. Williams that I could concur with Dr. Knipling's judgment that Dr. Crystal would exercise extreme caution to prevent escape.

Dr. Williams asked that we do a comparative study of the chromosomes of Puerto Rican and American screwworms. I checked with our specialists here, and Dr. LaChance thinks that there is a possibility of making some good squashes of testes from the 5 vials of larvae sent here. Dr. Riemann will try to work up this material but has small hope of success. That is why I am sending the pint of special preservative to Dr. Crystal.

If it is convenient, I would like for Dr. Crystal to dissect reproductive tracts, either from pupae near the point of emergence or from flies less than 1 day old, and preserve them in the fixative solution. At present Dr. Riemann would like testes from 50 flies of the Mission plant mass production strain. He would also like 50 flies from the newest laboratory colony of Mexican flies. We understand that there is also a colony at Mission of inbred Puerto Rican flies derived from one egg mas brought back by Mr. Baumhover several years ago. Because of the inadequate base for the strain originally and its questionable purity after all these years of laboratory confinement, I would not rely on data from it, but we think it would be interesting to examine testes from as many as 50 of those flies too. If we can get this material soon, it will give our staff a chance to practice techniques they have not used in some time and get not only base line information but have more assurance of not wasting new Puerto Rican specimens.

When Mr. Graham gets to Puerto Rico, it would probably be most efficient for him to send pupae back to Mission for the adults to emerge so that the females would not be wasted. However, if there are delays in obtaining permission for such a procedure, we hope that Mr. Graham can hold pupae in damp sand in Puerto Rico and send us specimens either from very late pupae or adults less than 1 day old. With his limited facilities, he probably cannot dissect out the reproductive tracts, so it would be adequate for him merely to cut off the abdomens and split them longitudinally before dropping them in the fixative.

I understand that Mr. Graham will fly back to Puerto Rico on October 6 to set up test animal pens on Vieques and collect egg masses for definite sterility records. If those records confirm the present indications that the released flies are not mating with the wild females in sufficient numbers, there is to be a new release program on Vieques patterned after our old Curacao experiment. I believe flies of the newest Mexican strain are to be reared on meat and released in one-mile swaths.

If this procedure does not succeed, it would indicate that some sort of barrier to mating must exist between the North American and Puerto Rican strains.

R C Bushland

R. C. Bushland
Director

cc: E. F. Knipling
Roger Drummond
M. E. Meadows
O. H. Graham
Donald Williams
C. H. Schmidt
M. M. Crystal

Dr Schmidt
Screwworm
Puerto Rico

November 19, 1971

Subject: Travel Authorization

To: H C Cox, Director
Entomology Research Division, ARS, USDA
Plant Industry Station
Beltsville, Maryland 20705

Attached are Xerox copies of two memoranda from Dr. Omohundro inviting me to the review of the screwworm eradication program in Puerto Rico and to a technical conference in Mission, Texas.

When I discussed this proposed travel with you yesterday, you asked whether I needed an amendment to my travel authorization, and I said that I did not. I find that I was in error in that opinion and that I had a special authorization for my trip to Puerto Rico last August (copy enclosed), and so I will need another.

My present plans are to fly to San Juan on Monday, November 29. I have arranged to inspect the test pens on Vieques with Dr. Williams and Dr. Meadows (Veterinarian in Charge of the Mission facility) on November 30. I understand that Dr. Schmidt is arranging for Dr. Crystal and Mr. Jones to be there too. On Wednesday we will participate in the critique at Ramey Air Force Base. Following that meeting, I will be available for consultation and field work in the area if it should develop that my assistance is needed in correcting difficulties in the program. I think it also might be necessary that I spend Thursday on the island with Dr. Crystal and Mr. Jones indoctrinating them in our field techniques. If I am not needed for program work on Friday, December 3, I plan to stay in Puerto Rico on annual leave until Monday, December 6, when I will fly to Mission, Texas. On December 7 I would inspect the mass production facilities in preparation for the conference on December 8. I will remain in Mission on December 9 to help implement any plans developing from the conference, and I will return to Fargo on December 10.

Would you please obtain for me a travel authorization to accomplish these plans.

R. C. Bushland

Enclosures/3

cc: C. H. Schmidt ✓
Donald Williams

November 19, 1971

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To: H C Cox, Director
Entomology Research Division, ARS, USDA
Plant Industry Station
Beltsville, Maryland 20705

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R. C. Bushland

Enclosures/3

cc: C. H. Schmidt
Donald Williams

Return to M&A

Screwworm

NOV 26 1971

Subject: Critique on Progress of Screwworm Eradication Program in Puerto Rico and the Virgin Islands

To: R. E. Omohundro
Acting Assistant Deputy Administrator
Animal Health
Animal and Plant Health Service
Veterinary Services

This is in reply to your memo on the same subject dated 17 November to C. H. Schmidt.

We concur in your suggestion that a representative from our Insects Affecting Man and animals Research Branch should attend this important meeting. Dr. Maxwell M. Crystal, In Charge, of our Mission, Texas, laboratory will attend. We are also planning to send another of our entomologists, Calvin M. Jones, from our Lincoln, Nebraska, laboratory. He is an excellent field man and we hope to temporarily loan him to Mission, Texas, to strengthen our research on the screwworm program.

In order to better coordinate research programs and requisite work-travel and at the same time allow us to provide maximum assistance to your programs, we will appreciate your forwarding to this office future invitations for our scientists to participate in various ANH work conferences.

HCCox

H C Cox, Director
Entomology Research Division

CHSchmidt:HCCox/mjb 11/24/71

Return to MSA

NOV 26 1971

Subject: Critique on Progress of Screwworm Eradication Program in Puerto Rico and the Virgin Islands

To: R. E. Omohundro
Acting Assistant Deputy Administrator
Animal Health
Animal and Plant Health Service
Veterinary Services

This is in reply to your memo on the same subject dated 17 November to C. H. Schmidt.

We concur in your suggestion that a representative from our Insects Affecting Man and Animals Research Branch should attend this important meeting. Dr. Maxwell M. Crystal, In Charge, of our Mission, Texas, laboratory will attend. We are also planning to send another of our entomologists, Calvin M. Jones, from our Lincoln, Nebraska, laboratory. He is an excellent field man and we hope to temporarily loan him to Mission, Texas, to strengthen our research on the screwworm program.

In order to better coordinate research programs and regulate work-travel and at the same time allow us to provide maximum assistance to your programs, we will appreciate your forwarding to this office future invitations for our scientists to participate in various ARS work conferences.

H C Cox, Director
Entomology Research Division

CHSchmidt:HCCox/mjb 11/24/71

Screwworm Puerto Rico
12-08-71 + V1
CHS
(R) 7

UNITED STATES DEPARTMENT OF AGRICULTURE
Animal and Plant Health Service
Veterinary Services
FEDERAL CENTER BUILDING
HYATTSVILLE, MARYLAND 20782

NOV 26 1971

Subject: Five-gram Packets of Five Percent Coumaphos (Asuntol)

To: Mr. Samuel Billings
Chief Entomologist
Environmental Protection Agency
Pesticide Regulation Division
Washington, D. C.

This refers to previous telephone conversations between you and Dr. Williams on this subject.

On June 1, 1971, we started releasing sterile flies over Puerto Rico and the Virgin Islands as part of a cooperative effort between USDA's Entomology Research Division, USDA-APHS Veterinary Services, the U.S. Air Force, and the governments of Puerto Rico, U.S. Virgin Islands, and British Virgin Islands. The purpose of the program was to test such things as wide swath widths, big boxes, liquid media reared flies, and methods for bulk transportation of pupae. We also have the goal to eradicate screwworms from these areas. We are enclosing correspondence to Senator Holland, Dr. Mulhern, and Mr. Scruggs, Vice President of the Southwest Animal Health Research Foundation, which describes the experimental nature of the program.

Because the program is not achieving success as soon as expected, we need to add another tool or procedure to further support the sterile fly releases in an attempt to achieve eradication. We would like to use the five-gram packets of five percent coumaphos (Asuntol) which we have surplus to our needs in Mexico as a screwworm larvicide to speed the program along. Coumaphos would be distributed by our veterinarians and livestock inspectors to the producers who would use it only as directed by us. The coumaphos is in our warehouse at Mexico City and we will not ship it to Puerto Rico for use there until we have your approval. We would appreciate having your consent to use this product. We will be able to furnish you a sample packet, with its label, in a few days.

We will be glad to meet with you, and, possibly, members of the Entomology Research Division to further explain procedures for the use of coumaphos in our experimental work in Puerto Rico.

R. E. Omohundro

R. E. Omohundro
Acting Assistant Deputy Administrator
Animal Health

3 Enclosures

cc: C. H. Schmidt, Beltsville, Maryland

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL HEALTH DIVISION
FEDERAL CENTER BUILDING
HYATTSVILLE, MARYLAND 20782

NOV 26 1971

Subject: Five-gram Packets of Five Percent Coumaphos (Asuntol)

To: Mr. Samuel Hilliker
Chief Entomologist
Environmental Protection Agency
Pesticide Regulation Division
Washington, D. C.

This refers to previous telephone conversations between you and Dr. Williams on this subject.

On June 1, 1971, we started releasing sterile flies over Puerto Rico and the Virgin Islands as part of a cooperative effort between USDA's Entomology Research Division, USDA-APHIS Veterinary Services, the U.S. Air Force, and the governments of Puerto Rico, U.S. Virgin Islands, and British Virgin Islands. The purpose of the program was to test such things as wide swath width, bag boxes, liquid sodium vapor lites, and methods for bulk transportation of pupae. We also have the goal to eradicate screwworm from these areas. We are enclosing correspondence to Senator Holland, Dr. Mulhern, and Mr. Scruggs, Vice President of the Southwest Animal Health Research Foundation, which describes the experimental nature of the program.

Because the program is not achieving success as soon as expected, we need to add another tool or procedure to further suppress the sterile fly release in an attempt to achieve eradication. We would like to use the five-gram packets of five percent coumaphos (Asuntol) which we have employed in our moves in Mexico as a screwworm larvicide to speed the program along. Coumaphos would be distributed by our veterinarians and livestock inspectors to the producers who would use it only as directed by us. The coumaphos is in our warehouse at Mexico City and we will not ship it to Puerto Rico for use there until we have your approval. We would appreciate having your consent to use this product. We will be able to furnish you a sample packet, with its label, in a few days.

We will be glad to meet with you, and, possibly, members of the Entomology Research Division to further explain procedures for the use of coumaphos in our experimental work in Puerto Rico.

R. E. Gomboske

R. E. Gomboske
Acting Assistant Deputy Administrator
Animal Health

CONFIDENTIAL

NOV 1 1971

AFSHIN

Dr. C. G. Scruggs, Vice President
Southwest Animal Health
Research Foundation
3312 Noble Avenue
Dallas, Texas 75204

Dear Mr. Scruggs:

The screwworm eradication program in Puerto Rico was conceived and developed as an area to test eradication procedures while accomplishing eradication in Puerto Rico and the Virgin Islands. New procedures involving wide swath sprays, big boys, liquid media reared flies, and methods for bulk transportation of pupae have been developed since the Florida program. They have not been used in a program that resulted in the complete eradication of screwworms from an area isolated from outside screwworm influence. It is essential that we evaluate these procedures before eradication is undertaken in Mexico.

On August 23, 1971, a meeting was held in Puerto Rico to evaluate progress since the program started June 1, 1972. Reports given during that meeting indicated that bulk pupae handling techniques and storage techniques and the equipment used for that purpose need further refinement. The Air Force developed a refrigerated environmental control unit to hold pupae that can be used in flight and on the ground. We are also using surplus reefers from Mexico for ground storage. Unfortunately, there have been several problems with the equipment. For instance, it is very susceptible to power surges and it does not have sufficient cooling capacity to maintain temperatures at optimum levels.

We believe that Mr. Jones's experience would be valuable in solving some of these problems. Would SWARF be interested in helping further development of equipment and techniques by making Mr. Jones's services available and by underwriting additional development costs for the equipment?

The fly drop in Puerto Rico has also cast some doubt on the effectiveness of the wide swath sprays, big boy techniques in a sub-tropical humid environment. We are doing field tests and making program adjustments to further test the eradication potential of these procedures. We are also evaluating the efficiency of liquid media reared flies.

As you know, Mr. T. A. Kincaid attended the Puerto Rico meeting in August. SWMRC's continued interest and support, as demonstrated by Mr. Kincaid's attendance, is appreciated. I hope you can have representatives at the next evaluation meeting tentatively scheduled for December 1, 1971, at Ramey Air Force Base in Puerto Rico. I believe the Puerto Rico program can prove extremely important as a vehicle to help select eradication procedures that will work in semi-tropical areas in Mexico. It is therefore important that we act quickly in order to take full advantage of the opportunity in Puerto Rico.

Budget limitations will not permit greater expenditure of federal funds for this purpose.

When an agreement is reached with the Mexicans and the money is appropriated for the Mexican program, the available time and available test sites will probably not permit adequate equipment testing before the program starts.

The current screwworm situation in northern Mexico is not good. The case incidence is very heavy, particularly in the critical areas of northeastern Mexico. Abnormally heavy rainfall has probably influenced this build up. Regardless of the reasons, it is more important than ever that ranchers "inspect, collect, and treat."

Sincerely,

R. S. Sharman
Director

cc:
E. J. Wilson, ARS, Hyattsville, Maryland
J. L. Wilbur, APHIS, Hyattsville, Maryland
A. A. Bellin, Mexico City, Mexico
R. E. Meadows, ARS, Mission, Texas

APHS:ARS:DLWilliams:WRoss:dgb 10-29-71

SW file

NOV 9 1970

Subject: Screwworm Eradication in Puerto Rico and the Virgin Islands

To: F. J. Mulhern
Associate Administrator

Through: E. E. Saulmon, Deputy Administrator

Enclosed are identical letters on this subject to Senators Holland and Hruska and Representatives Langen and Whitten.

Eradication of screwworms from Puerto Rico and the Virgin Islands has a favorable benefit cost ratio. The ratio at a 10 percent discount rate is 23:1. At a 6 percent discount rate the benefit cost ratio is 40:1. The Special Operations Force of the USAF proposed a plan of cooperation in this program by transporting flies from Mission, Texas, to Puerto Rico and distributing them over Puerto Rico and the Virgin Islands. USAF costs are not included in the benefit cost ratio.

In addition to the losses in livestock, screwworm infestations are often found in humans. In 1965, a limited survey of cases of human myiasis in Puerto Rico was made through the cooperation of physicians in health centers and hospitals of the metropolitan area. Ten human cases were found. There were probably many more.

Because of the isolated location of Puerto Rico and the Virgin Islands, the screwworm population of these islands provides an ideal ecological situation in which to develop new methods for sterile fly handling and distribution, and to further improve techniques already in use.

Investigations could include the following:

1. The effectiveness of fluid media reared sterile flies on previously untreated native screwworm populations.

2. The feasibility of distributing sterile pupae from the production plant to distribution centers in bulk by cargo aircraft. We believe it will be more efficient to distribute the screwworm pupae by aircraft if and when a program is started in Mexico.

3. The strain differences and population dynamics of screwworm flies.

4. The thin film technique of fly release.

5. The hypothesis that sterile flies can be effectively released from large boxes along wide swaths.

We estimate that the total cost of the cooperative program will be $200,000. This estimate does not include the cost to the USAF if they participate. The $200,000 will be divided in the following manner: Salary, per diem, and travel is estimated to cost $62,080; costs of production and irradiation of pupae at Mission, Texas, for the Puerto Rican program is estimated to be $62,920; field work, spraying of animals, and the cost of pesticides will be about $75,000.

The U.S. Government will assume one-half of the cost of eradication (about $100,000). The Governments of Puerto Rico, the United States Virgin Islands, and the British Virgin Islands will bear the remaining costs.

The investigational work and observations that will be possible in Puerto Rico may produce results that will be useful in the present screwworm eradication program. For instance, we must prove that liquid media reared flies are just as effective as meat reared flies before switching total production to the cheaper fluid media.

R. A. Slavman

Acting Director
ANH Division

4 Enclosures

cc:
J. L. Wilbur, ANH, Hyattsville
R. L. Wilson, ANH, Hyattsville
R. L. Evinger, ANH, San Juan, Puerto Rico
S. C. Gartman, ANH, Mission, Texas
ARS Budget Division

ARS:ANH:WRoss:DLWilliams:NMeyer:rh 10/13/70
Per Dr. Mulhern-
Rewritten: ARS:ANH:WRoss:DLWilliams:cm Ext. 8625 11/5/70

December 28, 1970

Honorable Spessard L. Holland
Chairman, Subcommittee on Department of
Agriculture and Related Agencies
Committee on Appropriations
United States Senate
Washington, D. C.

Dear Senator Holland:

The success of the screwworm eradication program in the continental United States made possible by mass releasing of sterile screwworm flies has stimulated considerable interest among agricultural officials and livestock producers in Puerto Rico and the United States Virgin Islands.

The livestock people in these islands are vitally interested in the possibility of eradicating this serious livestock pest from their areas. We have been informed that losses due to screwworms amount to about $500,000 each year in Puerto Rico and about $15,000 in the United States Virgin Islands. Saint Croix, the largest island in the United States group, has not yet reported the existence of screwworms.

Scientists in this Department have studied this problem for several years. They have come to the conclusion that eradication can be accomplished in Puerto Rico and the Virgin Islands within a year after initiation of the program. Because of the serious problems caused by the screwworm in these islands, we hope to begin the eradication effort in the near future.

The cost of eradication would be approximately $250,000 including the cost of United States Air Force participation. Puerto Rico has made available $[illegible]00 for screwworm eradication. The United States Virgin Islands have appropriated $20,000 for this purpose.

The Special Operations Force of the United States Air Force is interested in working with the Department in this program. They would like to participate in order to train their personnel in the techniques of sterile fly release so that their people can teach these methods to the air force personnel of other countries. They propose to transport the sterile screwworm pupae from the production facility at Mission, Texas, to Puerto Rico and subsequently distribute the sterile flies over the land areas of Puerto Rico and the Virgin Islands. A few of the nearby British Virgin Islands have a problem with screwworms, and some sterile flies should be released over them also.

With their cooperation, the Department's share in the cost of eradicating screwworms in this region would be approximately $100,000 which will [illegible]

from funds appropriated for the present program. This is possible because of the comparatively low incidence of screwworm throughout the barrier zone for the past five months. In addition, we hope to learn more about the effectiveness of such a program in a tropical area that could be beneficial if we ever extend the present eradication program further into Mexico.

Contributions from these governments would be used in the cooperative program to conduct field studies and to purchase material needed to raise flies at the United States Department of Agriculture screwworm fly production facility at Mission, Texas. The minor increase in sterile fly production at the Mission facility for this activity can be accomplished without any adverse effects to the continued maintenance of the sterile fly barrier zone in the southwestern United States and northern Mexico.

If you have questions or desire to know more about the implementation of this proposed program, we will be pleased to furnish you additional information.

A similar letter is being sent to Senator Hruska, Congressman Langen, and Congressman Whitten.

Sincerely,

N. P. Ralston,
Associate Director
Science and Education

Identical letters sent to Senator Hruska, Congressman Langen, and Congressman Whitten.

M+a ✓
Screwwor

DEC 7 1971

Subject: Entomology Research Division assistance in Puerto Rico screwworm eradication

To: E. J. Wilson
Acting Assistant Deputy Administrator
Animal Health

This is in reply to your memo of November 30 on the same subject to Dr. H C Cox.

We realize that Dr. Hightower's transfer to the tsetse fly project in Tanzania has left a void in the ecological aspects of the screwworm program. To partly fill this void, we will be glad to detail Mr. D. E. Hopkins (presently at Kerrville, Texas)--one of the few men left in our Division who has had extensive field experience on the screwworm--to the Puerto Rican program. The target date is early January 1972. In preparation for this assignment, he will be attending the screwworm review meeting at Mission, December 8, 1971.

Because of a very tight fiscal situation, would it be possible for Animal Health to defray part of the expenses for Mr. Hopkins' detail--either transportation and/or per diem?

C. H. Hoffmann

C. H. Hoffmann, Acting Director
Entomology Research Division

cc:
H. Rex Thomas, OA

ARS:ENT:CHSchmidt:CHHoffmann:bw 12-07-71

Screwworm
~~Mexico~~ Puerto Rico

Insects Affecting
Man & Animals

1/5/72

C.H.S.
~~R.A.H.~~
~~J.A.F.~~

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH SERVICE
VETERINARY SERVICES
FEDERAL CENTER BUILDING
HYATTSVILLE, MARYLAND 20782

January 4, 1972

Subject: Vieques

To: E. E. Saulmon
Deputy Administrator

At the last screwworm eradication meeting at Ramey Air Force Base held December 1, it was decided to use the new Mexican strain and to make comparative studies of hydro versus meat-reared flies. As a result of that meeting, for the past month we have released meat-reared flies over the northern one half of Puerto Rico, the United States and British Virgin Islands, and hydro-reared flies over the southern one half of Puerto Rico and the Island of Vieques.

During the past month, there have been 22 cases of screwworms reported from Vieques. No progress toward elimination of screwworms from Vieques can be detected. There have been 30 fertile egg masses and only one sterile egg mass reported from Vieques during this period. During the same period in southern Puerto Rico (hydro flies) 43 cases of screwworms were reported with 32 cases in northern Puerto Rico (meat-reared flies).

To further continue comparative studies between the hydros and the meat-reared flies, both the Hyattsville and Mission staffs recommend that meat-reared flies be released over Vieques starting January 6 and continuing until the next screwworm meeting on February 23 at Ramey Air Force Base. Hydro-reared flies will continue to be dispersed on the southern one half of Puerto Rico.

Unless you believe otherwise, we plan to put this plan into effect.

If this recommendation is accepted, this switch of meat for hydro flies will furnish the participants of the February 23 meeting additional data on which to base future screwworm eradication plans.

J. L. Hourrigan
Senior Staff Veterinarian
Sheep, Goat, Equine,
and Ectoparasites
Animal Health

cc:
E. J. Wilson, APHS, Hyattsville, Md.
R. L. Evinger, VIC, San Juan, Puerto Rico
J. L. Wilbur, APHS, Hyattsville, Md.
M. E. Meadows, Mission, Texas
C. H. Schmidt, Plant Industry, Beltsville

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH SERVICE
VETERINARY SERVICES
FEDERAL CENTER BUILDING
HYATTSVILLE, MARYLAND 20782

January 4, 1972

Subject: Viqueque

To: E. W. Jenkins
Deputy Administrator

At the last screwworm eradication meeting at Kirby Air Force Base, Ardo December 1, it was decided to use the new Mexican strain and to make comparative studies of hydro versus heat-treated flies. As a result of that meeting, for the past month we have released heat-treated flies over the northern one half of Puerto Rico, the United States and British Virgin Islands, and hydro-treated flies over the southern one half of Puerto Rico and the Island of Viqueque.

During the past month, there have been 22 cases of screwworm reported from Viqueque. No progress toward elimination of screwworm from Viqueque can be detected. There have been 30 fertile egg masses and only one sterile egg mass reported from Viqueque during this period. During the same period in northern Puerto Rico (hydro flies) 17 cases of screwworm were reported with 12 cases in northern Puerto Rico (heat-treated flies).

To further continue comparative studies between the hydro and the heat-treated flies, both the Hyattsville and Mexico strain heat-treated flies be released over Viqueque starting January 4 and continuing until the next screwworm meeting on February 25 at Kirby Air Force Base. Hydro-treated flies will continue to be released on the northern one half of Puerto Rico.

Unless you believe otherwise, we plan to put this plan into effect.

If this recommendation is accepted, this action of heat for hydro flies will furnish the participants of the January 12 meeting additional data on which to base future screwworm eradication plans.

J. L. Gourrigan
Senior Staff Veterinarian
Sheep, Goat, Equine,
and Entomological
Animal Health

cc:
R. J. Wilson, ARS, Hyattsville, Md.
R. L. Ewinger, VIO, San Juan, Puerto Rico
J. L. Wilber, ARS, Hyattsville, Md.
M. R. Meadows, Mission, Texas
R. H. Schmidt, Plant Industry, Beltsville

Screwworm
Puerto Rico

January 7, 1972

Subject: Puerto Rican Studies

To: D. E. Hopkins, USDA-ARS-ENT
c/o Dr. R. L. Evinger
G.P.O. Box 3488
Hato Rey, Puerto Rico 00904

Among the tests we would like you to try to conduct while on duty in Puerto Rico are the following:

Obtain some boxes of screwworms from Ramey Air Force Base when they arrive from Mission. Feed and hold the flies for about 48 hours to determine the degree of survival (or mortality).

Obtain additional boxes arriving at Ramey from Mission and release a few flies at "ground" level, observing general activity; that is, do they remain in the opened boxes for any length of time, or disperse immediately? If they fly immediately, do they continue flying, or settle on the nearest bush or other object?

Rear any strange-looking egg masses separately. Preserve a few larvae from each such egg mass for association with emerging adults. There are 4 species of Cochliomyia on Puerto Rico and the immature stages of C. aldrichi and minima are undescribed, as are their habits. We would hope to turn adults and associated large larvae over to a good fly taxonomist, C. W. Sabrosky, for identification and study. This may be quite important since misidentification of larvae found in wounds would yield false information on degree of sterility and with the larval characteristics and habits of two species not known, the possibility definitely exists.

Claude H. Schmidt

Claude H. Schmidt, Chief
Insects Affecting Man and
Animals Research Branch

cc:
M. M. Crystal, ENT
R. O. Drummond, ENT
D. Williams, ANH
R. L. Evinger

JAFluno/mjb

JAF

January 7, 1972

Subject: Puerto Rican Studies

To: D. R. Hopkins, USDA-ARS-ERT
c/o Dr. A. E. Avinger
G.P.O. Box 3423
San Juan, Puerto Rico 00936

Among the tasks we would like you to try to complete while on duty in Puerto Rico are the following:

Obtain some boxes of scrapworms from Army Air Force base when they arrive from Alaska. Feed and hold the files for about 48 hours to determine the degree of survival (or mortality).

Obtain additional boxes arriving at Ramey from Alaska and release a few files at "ground" level, observing general activity; that is, do they remain in the opened boxes for any length of time, or disperse immediately? If they fly immediately, do they continue flying, or resight on the nearest bush or other object?

Test any strange-looking egg masses separately. Preserve a few larvae from each such egg mass for association with emerging adults. There are 4 species of Cochliomyia on Puerto Rico and the immature stages of C. hominivorax and macellaria are undescribed, as are their habits. We might hope to have adults and associated large larvae over to a good fly taxonomist, C. W. Sabrosky, for identification and study. This may be quite important since misidentification of larvae found in wounds would vitiate information on degree of sexuality and with the larval characteristics and habits of two species not known, the possibility definitely exists.

Claude E. Schmitz, Chief
Insects Affecting Man and
Animals Research Branch

cc:
M. R. Cryzal, ERT
K. O. Beacham, ERT
G. Williams, AHM
A. L. Avinger

JAF:lumo/mjb

U.S. DEPARTMENT OF AGRICULTURE

REFERENCE SLIP

DATE 2-8-72

TO

Dr Clark Schmidt

- [ ] ACTION
- [ ] NOTE AND RETURN
- [ ] APPROVAL
- [ ] PER PHONE CALL
- [ ] AS REQUESTED
- [ ] RECOMMENDATION
- [ ] FOR COMMENT
- [ ] REPLY FOR SIGNATURE OF
- [x] FOR INFORMATION
- [ ] RETURNED
- [ ] INITIALS
- [ ] SEE ME
- [ ] NOTE AND FILE
- [ ] YOUR SIGNATURE

REMARKS

Insects Affecting
Man & Animals

2-8-72

C.H.S.
~~R.A.H.~~
J.A.F.

FROM

GPO : 1964 OF—742-059

FORM **AD-514** (8-64)

Dr Williams
Screwworm
Puerto Rico

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH SERVICES
VETERINARY SERVICES
G.P.O. BOX 3488, SAN JUAN, P. R. 00936

February 4, 1972

Subject: Third Screwworm Eradication Program Critique, Puerto Rico, U. S. & British Virgin Islands

To: Prospective Participants

The third subject critique will be held at Ramey Air Force Base, Aguadilla, Puerto Rico, on February 23, 1972 at 8:30 AM. The purpose of the critique will be to review past actions and make positive recimmendations for a terminal eradication program.

Housing will be provided at the Visiting Officers' Quarters on the Base. The meeting place will be announced when you arrive by a notice posted at the VOQ and the Distribution Center. There is now commercial air service available between San Juan and Ramey AFB. Both North Cay and PRINAIR Airlines have several flights each day.

R. L. Evinger

R. L. Evinger
Veterinarian in Charge
Animal Health

Screwworm

April 7, 1972

Subject: Puerto Rico Screwworm Eradication Program Critique

To: Maxwell M. Crystal, Entomologist-in-Charge
Livestock Insects Investigations
Mission, Texas

We checked the airline schedules and believe that your best flight arrangements would be TT #970, leaving McAllen at 1:08 p.m., arriving Houston 2:05 p.m., continuing on DL #910, leaving Houston 3:40 p.m., and arriving at Friendship Airport in Baltimore, Md., at 8:06 p.m. From Friendship you can get an airport limousine directly to the QUALITY COURT MOTEL, 7200 Baltimore Ave., College Park, Md. This is a convenient place to stay as it is not too far from our offices and from the Federal Center Building in Hyattsville, where the April 18 meeting will be held. This is the motel where most USDA visitors stay, and I am almost certain that Dr. Meadows and the other APHIS personnel will be there. Don Hopkins will be attending the meeting and will stay at this motel. If you like, John Fluno can pick you up on the 18th and you can go to the screwworm meeting together.

We will make you a reservation at Quality Court for April 17, 18, and 19. Let us know if this is not agreeable with you.

Claude H. Schmidt, Chief
Insects Affecting Man and Animals
Research Branch

CHSchmidt:bw

cc: R. O. Drummond
D. Hopkins

April 7, 1972

Subject: Puerto Rico Screwworm Eradication Program Critique

To: Donald M. Crystal, Entomologist-in-Charge
Livestock Insects Investigations
Mission, Texas

We checked the airline schedules and believe that your most direct arrangements would be TT 1070, leaving HOUSTON at 1:08 p.m., arriving Houston 1:05 p.m., connecting on DL 710, leaving Houston 1:40 p.m., and arriving at Friendship Airport in Baltimore, Md., at 6:00 p.m. From Friendship you can get an airport limousine directly to the QUALITY COURT MOTEL, 7200 Baltimore Ave., College Park, Md. This is a convenient place to stay as it is not too far from our offices and from the Federal Center building in Beltsville, where the April 18 meeting will be held. This is the most direct and the cheapest way, and I am almost certain that Dr. Meadows and the other APHIS personnel will be there. Dr. Hopkins will be attending the meeting and will stay at this hotel. If you like, John Flynn can pick you up on the 18th and you can go to the screwworm meeting together.

We will make you a reservation at Quality Court for April 17, 18 and 19. Let us know if this is not agreeable with you.

Claude de Schmit, Chief
Insects Affecting Man and Animals
Research Division

Concurrence:

cc: R. O. Drummond
D. Hopkins

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Entomology Research Division
P. O. Box 986
Mission, Texas 78572

April 4, 1972

Subject: Puerto Rico Screwworm Eradication Program Critique

To: Claude H. Schmidt, Chief
Insects Affecting Man and Animals Research Branch

Dr. Drummond informed me yesterday by telephone that the subject conference will take place on Tuesday, April 18, in Hyattsville and that I should plan to attend.

Accordingly, I will arrange to arrive Monday evening, April 17, and check into a Washington hotel. The only hotel with which I am familiar is the Mayflower. Would you please make a reservation there for me for a single room at minimum rate for late arrival Monday evening and for Tuesday and Wednesday nights. If you know of another hotel which you believe would be preferable, please make my reservation there and let me know.

I will need to know where the Hyattsville meeting will be held, at what time it will start, and the best means of transportation for getting there.

My plans also include spending Wednesday at the Beltsville Center visiting Branch and other facilities as you see fit. Here, too, please advise me on location, time and transportation from Washington. I expect to return to Mission Thursday morning.

Maxwell M. Crystal

Maxwell M. Crystal
Research Entomologist
In Charge

cc: R. O. Drummond

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Entomology Research Division
P. O. Box 385
Mission, Texas 78572

April 4, 1972

Subject: Puerto Rico Screwworm Eradication Program Critique

To: Claude H. Schmidt, Chief
Insects Affecting Man and Animals Research Branch

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Maxwell M. Crystal

Maxwell M. Crystal
Research Entomologist
In Charge

cc: R. O. Drummond

MAR 12 1973

Eat

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WASHINGTON, D. C. 20250

MAR 8 1973

Subject: Screwworm Work Conference at Ramey AFB, Puerto Rico

To: A. W. Cooper
Acting Deputy Administrator
ARS - Southern Region

We are having a Technical Conference at Ramey AFB, Puerto Rico, on the screwworm methods development work in Puerto Rico at 9:30 a.m. on March 28, 1973.

We would appreciate having you and other members of Agricultural Research Service under your supervision participate in this Conference. We would particularly like to have Dr. R. C. Bushland and Mr. A. Baumhover attend.

J. M. Hejl

J. M. Hejl
Acting Deputy Administrator
Veterinary Services

cc:
Dr. A. E. Decoteau, APHIS-VS, San Juan, Puerto Rico
Dr. R. C. Bushland, ARS, Mission, Texas
Mr. A. Baumhover, ARS, Oxford, North Carolina
Mr. E. A. Taylor, ARS, Weslaco, Texas
Dr. L. Henderson, ARS, Beltsville, Maryland
Dr. M. E. Meadows, APHIS-VS, Mission, Texas
Dr. H. C. King, APHIS-VS, Hyattsville
Dr. J. L. Wilbur, APHIS-VS, Hyattsville

OK Eat

Dr. Bushland called 3/12/73 on this matter and would like to attend. He considers it very important for his program; that they are raising all flies for Puerto Rico. Jeanette

Mr. Taylor
For your information
B

Dr. R. C. Dunham
Mission

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
VETERINARY SERVICES
FEDERAL CENTER BUILDING
HYATTSVILLE, MARYLAND 20782

RECEIVED
MAR 22 1973
AREA OFFICE
WESLACO, TEXAS

March 14, 1973

Subject: Screwworm Methods Development Work in Puerto Rico

To: E. E. Saulmon
Deputy Administrator

On December 18, 1970, Dr. Ross and Dr. Williams visited Colonel Pyatt in his office in the Pentagon and explained the need to conduct screwworm methods development work in Puerto Rico. They informed him that with the Air Force's cooperation in transporting sterile flies from Mission, Texas, to Puerto Rico and in releasing them over Puerto Rico, screwworms could probably be eradicated from Puerto Rico and the Virgin Islands in less than one year. Sterile fly releases started on June 1, 1971, and screwworms were eradicated from the U.S. Virgin Islands and the British Virgin Islands in December 1972. After 20 1/2 months of fly releases, screwworm cases continue to be found in Puerto Rico. Using our very best hindsight, there are several reasons for this.

1. The Puerto Rican ranchers, veterinarians, and officials, together with our veterinarians who served in Puerto Rico for the past 15 years, did not realize how serious the screwworm problem was. As a result of this, we underplanned for the program in terms of sterile flies needed and ground support needed to carry out the program.

2. Sterile flies are stressed between the time they are shipped from Mission, Texas, to the time they are released in Puerto Rico. Fly-holding facilities and personnel have been inadequate to handle 15 million sterile flies per week. Thus, the logistics of the ten-fold fly drop increase were not anticipated, adding to the stress on the flies.

3. Livestock husbandry practices on Puerto Rico and especially on Vieques encourage the propagation of screwworms.

4. We have only been able to put one spray rig in the field to be used to spray livestock around outbreaks.

There has been progress in eliminating screwworms from certain areas of Puerto Rico. There have only been two cases of screwworms in the western one-third of Puerto Rico since December 1, 1972, and none of

these cases have been discovered recently. On the extreme eastern end of the Island there are also three municipalities which appear to be free from screwworms.

The Air Force staff has informed this Department that the Air Force is seriously considering the continuation of operations beyond June 30, 1973, should we desire. A final answer is expected before the March 28, 1973, Technical Screwworm Conference in Puerto Rico. The following measures are now being taken to help further reduce the screwworm population in Puerto Rico:

1. On March 20, 1973, two helicopters from the Navy will be detailed to Vieques to fly over the Camp Garcia area to drive livestock now in the impact area into safer parts of the Island so they can be inspected and treated for screwworms.

2. After this is accomplished, the fence will be repaired to prevent other animals from entering the impact or war-game area.

3. During the week of March 19, 1973, there will be a total of five spray rigs sufficiently manned by personnel to spray animals around chronic outbreak areas. The limited spraying work that has been done to date shows much promise in eliminating infestations from chronically infested herds of beef cattle and swine. An example of the effect of our activities is as follows:

> An elderly livestock owner near Ponce, in south-central Puerto Rico, states that, as a result of three sprayings with coumaphos at 2-week intervals, this is the first time in his memory his beef herd has been free from screwworms. We are receiving many favorable reports such as this one from areas where we are spraying.

4. We have requested that the Air Force take the necessary steps to prevent the environmental control unit from overheating, which causes pupae to develop too rapidly in flight.

5. We plan to reevaluate all handling procedures and to make improvements when necessary.

6. We should continue the fly drop on Puerto Rico at 15 million flies per week.

7. Since December 1972 the field survey and case detection activities have increased to the point that we can now pinpoint areas of heavy infestation.

8. Our fly-holding facilities are being expanded to handle 15 million sterile flies per week without severe losses.

9. The Commonwealth of Puerto Rico has finally provided sufficient personnel to properly handle 15 million sterile flies per week.

10. On March 28, 1973, we plan to hold a Technical Screwworm Conference at Ramey Air Force Base to evaluate the program further.

This memorandum is being written because there has been some thought given to stopping the program on June 30, 1973, regardless of how much progress we will have made at that time. We believe that it is now premature to decide to arbitrarily stop the program at the end of this fiscal year. What we need to do is intensify our evaluation of the program and make the necessary adjustments. In other words, we are not ready to admit that we are unable to solve the problems being encountered in Puerto Rico. The experience being gained in the manipulation of screwworm strains and the hauling of pupae over long distances will be invaluable in the Mexican program.

Donald Miller

Donald Miller
Director
Programs Development and Application

cc:
Dr. M. E. Meadows, APHIS-VS, Mission
Dr. R. C. Bushland, ARS, Mission
Dr. A. E. Decoteau, APHIS-VS, San Juan
Dr. H. C. King, APHIS-VS, Hyattsville
Dr. J. L. Wilbur, APHIS-VS, Hyattsville

MAR 19 1973

Mr. Taylor
Weslaco, Tex.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOUTHERN REGION
701 LOYOLA AVENUE
P. O. BOX 53326
NEW ORLEANS, LOUISIANA 70153

March 14, 1973

Subject: Screwworm Work Conference
at Ramey AFB, Puerto Rico

To: J. M. Hejl, Acting Deputy Administrator
Veterinary Services, APHIS
Washington, D. C.

This is in response to your March 8 memorandum to Dr. A. W. Cooper inviting our participation in the subject conference in Puerto Rico on March 28. We appreciate the invitation; however, both Dr. Cooper and I have previously arranged commitments on that date.

In the event that they do not have conflicting schedules, we will be pleased to have Dr. R. C. Bushland and Mr. A. M. Baumhover attend the conference. A copy of this memorandum is being sent to them; however, you may want to contact them directly.

H C Cox
Associate Deputy Administrator

cc:
R. C. Bushland, Mission, Texas
A. M. Baumhover, Oxford, N. C.
E. A. Taylor, Weslaco, Texas
G. R. Burns, Raleigh, N. C.

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WASHINGTON, D. C. 20250

1	Cooper
2	Cox
	Reine
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	Marcley
	Bridges
	Lucy

MAR 8 1973

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To: A. W. Cooper
Acting Deputy Administrator
ARS - Southern Region

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We would appreciate having you and other members of Agricultural Research Service under your supervision participate in this Conference. We would particularly like to have Dr. R. C. Bushland and Mr. A. Baumhover attend.

J. M. Hejl

J. M. Hejl
Acting Deputy Administrator
Veterinary Services

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5 da

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WASHINGTON, D.C. 20250

22 AUG 1973

Subject: Screwworm Program Critique in Puerto Rico

To: A. W. Cooper
Deputy Administrator
ARS - Southern Region

We are planning the next Technical Screwworm Program Critique on the screwworm methods development work in Puerto Rico at 9:30 a.m. on September 18, 1973. It is tentatively scheduled to be held at Roosevelt Roads Naval Air Station, Puerto Rico. In the past, the meeting has been completed in one day.

The agenda has not been completed as yet, but will include discussions of screwworm status reports and evaluations of our operations in Vieques and Puerto Rico.

Since July 1, the U.S. Air Force Reserve has assumed the aerial delivery and distribution of sterile flies and their representatives will participate.

We would appreciate having you or other members of the Agricultural Research Service under your supervision participate in this Critique. We would particularly like to have Dr. R. C. Bushland and Mr. A. H. Baumhover attend.

J. M. Hejl

J. M. Hejl
Acting Deputy Administrator
Veterinary Services

cc:
Mr. E. A. Taylor, ARS, Weslaco, Texas

RECEIVED
AUG 24
AREA OFFICE
WESLACO, TEXAS

Mr. Taylor
concur on travel
to attend this
J.E.

J. M. Hejl
Acting Deputy Administrator
Veterinary Services

cc:
Mr. E. A. Taylor, ARS, Weslaco, Texas

U.S. DEPARTMENT OF AGRICULTURE

REFERENCE SLIP

DATE 8/24

TO

EA Taylor

Wesco

- [ ] ACTION
- [ ] NOTE AND RETURN
- [ ] APPROVAL
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- [ ] AS REQUESTED
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- [ ] FOR COMMENT
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- [x] FOR INFORMATION
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- [ ] SEE ME
- [ ] NOTE AND FILE
- [ ] YOUR SIGNATURE

REMARKS Just in case you didn't get a copy, I'm sending this for insurance.

I hope that you will approve this travel.

I discussed this trip with

FROM

(over)

GPO : 1964 OF—742-059

FORM **AD-514** (8-64)

Dr. Meadows this morning and said that if Baumhower and I were to go to Puerto Rico it would be a good occasion for Meadows to help me do a selling job on persuading Al to move to Mission.

Meadows told me that Dr. Norman Meyer told him yesterday that he was recruiting Baumhower for his staff in Mexico City. I told Meadows that on Wednesday Meyer told me he was hiring Hightower. Meadows said that he had the impression that Meyer was trying to hire both and was offering the top job to Baumhower.

So you'll have to give Al a real sales pitch when you phone him next week.

Bush

UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
WASHINGTON, D.C. 20250

22 AUG 1973

FILE: SECTION Research
SUBJECT Screwworm
FOLDER Puerto Rico Proj.

Subject: Screwworm Program Critique in Puerto Rico

To: A. W. Cooper
Deputy Administrator
ARS - Southern Region

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J. M. Hejl

J. M. Hejl
Acting Deputy Administrator
Veterinary Services

cc:
Dr. R. C. Bushland, ARS, Mission, Texas ✓

RECEIVED
AUG 27 1973
AREA OFFICE
WESLACO, TEXAS

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOUTHERN REGION
701 LOYOLA AVENUE
P. O. BOX 53326
NEW ORLEANS, LOUISIANA 70153

EWT

August 28, 1973

Subject: Screwworm Program Critique in Puerto Rico

To: J. M. Hejl
Acting Deputy Administrator
Veterinary Services, APHIS

This is in response to your August 22 letter to Dr. A. W. Cooper regarding the above subject. We were pleased to learn that the next Technical Screwworm Program Critique will be held in Puerto Rico on September 18 and appreciate the invitation to attend. Unfortunately, Dr. Cooper has a previously scheduled commitment on that date and I will be unable to attend for the same reason. We certainly concur in the desirability of having Dr. R. C. Bushland and Mr. A. H. Baumhover attend if their schedules will permit.

H C Cox

H C Cox
Associate Deputy Administrator

cc:
George R. Burns, Area Director, Raleigh, North Carolina
E. A. Taylor, Area Director, Weslaco, Texas

RECEIVED
AUG 31 1973
AREA OFFICE
WESLACO, TEXAS

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOUTHERN REGION
701 LOYOLA AVENUE
P. O. BOX 53326
NEW ORLEANS, LOUISIANA 70153

August 28, 1973

Subject: Screwworm Program Critique
in Puerto Rico

To: J. H. Hoyl
Acting Deputy Administrator
Veterinary Services, APHIS

This is in response to your August 22 letter to Dr. A. W. Cooper regarding the above subject. We were pleased to learn that the next Technical Screwworm Program Critique will be held in Puerto Rico on September 18 and appreciate the invitation to attend. Unfortunately, Dr. Cooper has a previously scheduled commitment on that date and I will be unable to attend for the same reason. We certainly regret the desirability of having Drs. Bruce Hendricks and W. A. Baumhover attend if their schedules will permit.

H C Cox

H C Cox
Associate Deputy Administrator

cc:
George R. Burns, Area Director, Raleigh, North Carolina
R. A. Taylor, Area Director, Mesilco, Texas

x xxxxxxxxxxxxxxxxxxxxx

Southern Region
Tobacco Research Laboratory
Oxford, North Carolina 27565

June 14, 1974

Subject: Current Status of Screwworm Eradication Program in Puerto Rico

To: A. W. Cooper, Deputy Administrator
USDA-ARS-Southern Region
P. O. Box 53326
New Orleans, Louisiana 70153

Thru: G. R. Burns, Area Director
USDA-ARS-Southern Region
N. C. State University
P. O. Box 5847
Raleigh, North Carolina 27607

In response to Dr. R. J. McCracken's inquiry regarding my review of the above program, I spent May 28 through June 6, 1974 in Puerto Rico. This program was initiated in June 1971 and, in addition to Puerto Rico, 17 additional islands in the U. S. and British Virgin Islands were initially treated. Since screwworms no longer exist in the Virgin Islands, sterile releases have been discontinued. Vieques and Culebra, belonging to the Commonwealth of Puerto Rico, have been free of screwworms for about one year but releases are being continued because of their proximity to the main island and the possibility of reinfestation.

For several reasons I believe the optimism for imminent success in the remaining infested area, the main island of Puerto Rico, is amply justified:

[illegible]

Southern Region
Tobacco Research Laboratory
Oxford, North Carolina 27565

June 17, 1971

Subject: Screwworm Status of Screwworm Eradication Program in Puerto Rico

To: A. W. Cooper, Deputy Administrator
USDA-ARS-Southern Region
P. O. Box 53326
New Orleans, Louisiana 70153

From: D. H. Arthur, Area Director
USDA-ARS-Southern Region
N. C. State University
P. O. Box 5647
Raleigh, North Carolina 27607

In response to Dr. R. J. Bechtoldt's inquiry regarding my review of the above program, I spent May 26 through June 3, 1971 in Puerto Rico. This program was initiated in June 1971 and, in addition to Puerto Rico, 17 additional islands in the U. S. and British Virgin Islands were initially treated. Since screwworms no longer exist in the Virgin Islands, sterile releases have been discontinued. Vaccines and culture belonging to the Commonwealth of Puerto Rico have been free of screwworms for about one year but releases are being continued because of their availability to the mainland and the possibility of reinfestation.

Our several regions believe the quality of the insects are as good as the population increased even, the best insect of Puerto Rico, in my judgment.

1. As of April 1, 1974, adequate ground support has been available with 21 Bio Aids assigned to screwworm and hog cholera programs but concentrating primarily on screwworms under direct control of screwworm personnel. In addition, 9 spray crews of 2 men each (Commonwealth personnel) are on duty. All infested and surrounding herds, excluding swine and lactating dairy cattle, are being sprayed with Coral at 21-day intervals until 6 weeks have elapsed without an infestation.

2. Since March 23, 1974 ground releases of 40,000 flies or more per infested premise have been made weekly, usually within the same week discovered and no later than the following week. Beginning March 17, 1974, about 25% of the 15 million flies allotted to the island have been released strategically by air and since May 5 over 50% have been used in this manner. Currently these releases are being made in 16 problem areas which have had reported and/or confirmed cases during the preceding month. Releases are concentrated in canyons, water courses, near reservoirs and livestock concentrations.

3. Rancher interest has greatly improved since they are now seeing favorable results. Previously, many had become disillusioned and discarded sample kits issued to them. Community leaders are urging their neighbors to submit samples and some have volunteered to help round up and treat their neighbor's infested stock.

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4. The western one-fourth of the island has been free of screwworms for over 15 months, the northern plains for 18 months, the Utuado area, previously the most heavily infested, for 9 months and Ponce for 3 months. With the intensive ground support very few of the premises have been reinfested during the past 6 weeks.

5. Although egg mass collections since January 1, 1974 have been quite low, a total of only 17, 88% have been sterile in contrast with a similar period in 1973 when only 12% of the 242 masses were sterile. The low number of egg masses collected in 1974 can be attributed partly to termination of test pens and partly to the apparently low native populations.

6. Since August 1, 1973, logistics of transport and release of flies has been vastly improved. The Air Force Reserve flies non-stop from Mission, Texas to Roosevelt Roads on Friday, the flies emerge Saturday and are aerial-released on Sunday and Monday with ground releases being made on Saturday. Thus the flies are released promptly after emergence with only the flies for the Monday release subjected to chilling at 65° F for 24 hours or less. Previously, the insects were under chill up to 10 days which did not seriously affect emergence or longevity in the laboratory but greatly reduced activity in the field based on recent tests by APHIS at Mission, Texas. In addition, the Tex-Mex strain of flies, apparently more competitive than previous strains, is currently being released.

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7. I personally observed 207 susceptible animals in herds that had been recently infested. Only one of these was infested with screwworms. Fortunately, the 2 egg masses collected from the same wound were sterile.

Barring unforeseen breakdowns, it appears that the program is now in a "mopping" up operation to eliminate the few isolated infestations still occurring. Further comments follow:

1. Program Personnel

Dr. Kenneth R. Thompson is in charge of the program supported by Carmelo Gonzales supervising field activities in the northern half of the island with Sergio Murphy in the southern half. Along with Douglas Moring, temporarily in charge of the Distribution Center, an excellent team has been available since April 1, 1974 to conduct the program. All of these men are highly enthusiastic, capable and not only determined but confident that the program will succeed. Unfortunately, Moring was recalled recently to his permanent duty station. Unless he is able to return or an experienced replacement is found I believe the chances of success will be greatly reduced. Handling of the flies for release is critical and requires experience and judgment.

2. Headquarters Activities

A. Fly distribution.--Adequate facilities are available for emerging and holding the flies. When flies are in storage, personnel are constantly on duty to maintain optimum temperatures and to intercept power or equipment failures which may result in loss of the insects. Flies

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were in optimum condition during the releases I witnessed on the 2nd and 3rd of June. Checks inside the loaded plane indicated no rise in temperature in the release cartons. All of the hotspots scheduled for release were adequately covered. Flies delivered for ground release were in excellent condition and showed no signs of being overheated. The only disturbing question was fate of the flies after the cartons left the release chute. There was no consistent pattern in behavior of the cartons; some sailed out gently and opened as desired. Others twisted rapidly and some appeared to "explode". It was impossible to judge whether the flies were being injured but this may be possible with binoculars and/or a high-speed movie camera with a telephoto lens. Under certain conditions cartons failed to open but the dispersers have been instructed to open the rear flap to correct this situation.

B. Confirmation of cases.--Larva samples are being tentatively identified at the distribution center to permit prompt treatment of infested premises. Samples are subsequently submitted to Beltsville, Maryland for verification. Errors in identification would be rare since a high percentage of the samples currently are screwworms and only small or deteriorated specimens would be difficult to identify. The advantages of prompt treatment of infested premises would far outweigh possible errors in the initial identification.

C. Communication.--Field supervisors are in continual contact with headquarters to report cases detected in the field so that special

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C. Communication.--Field supervisors are in continual contact with headquarters to report cases detected in the field so that special

releases may be scheduled promptly. Information on positive samples received at headquarters are relayed to the field to permit prompt investigation and arrangement for spraying eligible, infested herds. Since telephone facilities are limited in certain areas, use of radio-equipped vehicles should be investigated.

D. Publicity.--Various radio and TV spots have been used to publicize the program. Four meetings with major livestock producers, arranged by local extension agents, have been held by Dr. Thompson and Mr. Gonzales and more are scheduled.

3. Recent Case Incidence

From March 31 through June 7, 1974 only 72 screwworm cases were detected compared with 143 during a similar period in 1973 for a reduction of 50%. With increased surveillance during this period in 1974, due to the presence of 21 Bio Aids, 9 spray crews and improved grower interest, reporting undoubtedly has increased. Using the non-screwworm samples as an index, 7 in 1973 and 15 in 1974, surveillance was 2.14 times greater in 1974 than in 1973. Total cases confirmed in 1973 likely would have been 306 (143 X 2.14) with the same level of surveillance as in 1974. On this basis the reduction in 1974 would have been 76.5% (306 - 72 = 234; 234 ÷ 306 = 0.765 or 76.5%) rather than the 50% actually recorded.

4. Problem Areas

In some areas livestock are of secondary importance and personnel and facilities to handle the stock are limited. As an example, a

releases may be scheduled promptly. Information on positive samples received at headquarters are relayed to the field to permit prompt investigation and arrangement for spraying eligible, infected herds. Since telephone facilities are limited in certain areas, use of radio-equipped vehicles should be investigated.

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4. Problem Areas

In some areas livestock are of secondary importance and personnel and facilities to handle the stock are limited. As an example, a

2000-acre coffee plantation near Jayuya pastures 60 head of beef cattle which are extremely wild and normally handled only when rounded up for sale. The foreman had reported a screwworm case recently and agreed to pen the animal for inspection. Workers on foot spent 2 hours attempting to confine the animal but were unsuccessful. Inspector Murphy later obtained the promise of the owner that the entire herd would be rounded up for spraying. In another situation near Vega Baja, the spraying operation was thwarted when the corral collapsed. Certain areas in the interior are accessible only with 4-wheel drive vehicles, horseback or on foot. Attempts are being made to obtain the needed vehicles. During the first 17 weeks of 1974 dogs had been responsible for 12% of the 120 cases reported. These have been primarily stray dogs received by the Humane Society at Ponce. Fortunately this area has been free of screwworms for the past 6 weeks following special releases. However, the many stray dogs previously reported at the city dump remain a potential hazard.

5. Progress in Contacting Owners

During April and May, Bio Aids were able to contact about 50% of the livestock owners and/or their representatives in the southern half of the island to explain the program, enlist their cooperation and leave sample kits and wound remedies. In the north 95% of the major producers (25 head or more) and about 50% of the small owners have been contacted. Within a few weeks it is anticipated that almost complete coverage will have been achieved.

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It seems apparent that the native screwworms on Puerto Rico do not disperse nearly as much as screwworms in the southwestern United States where the rate may be 100 miles per week during the spring and fall buildups. This is indicated by the many areas in which screwworms have been eliminated and have remained free for 3 to 18 months, including Vieques which has been free of screwworms for 12 months in spite of its proximity to the main island only 8 miles away. If much movement occurred one would expect an occasional case being caused by a fertile-mated female moving into a screwworm

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Although some owners were reluctant at first to round up their herds for spraying to control screwworms, the additional benefits of horn fly, tick and cattle grub control has created a great demand for this service. Incidentally, cattle grubs apparently are present only in cattle recently imported from the United States or Canada and have not been able to reproduce on the island. The adults are short-lived and females may not be able to find mates under low population densities. Three spraying operations were observed and in all instances thorough coverage of the animals was obtained. Rounding up livestock invariably induces additional wounds, however, from the standpoint of screwworm control this should be an advantage since these would act as "trap" wounds causing the female to oviposit where chances of survival of the larvae would be negligible. The spraying operation also has the advantage of making large numbers of animals available for close inspection and collection of larva and

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Except for the area between Aibonito and Ponce, Puerto Rico appeared to be receiving abundant rainfall and I saw no other areas in which adverse weather might be an important factor in suppressing screwworms. Wild hosts apparently are of minor concern since the deer population had been removed previously during a tick eradication program.

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Considerable movement of livestock occurs within the island, transporting animals for slaughter and moving dairy cattle to and from pastures where dry herds are maintained. Several screwworm infestations have been detected in animals recently transferred which could complicate the final phases of the program by increasing the number of areas requiring special treatment. Puerto Rico has a statute to control movement of livestock by owners, but dealers who buy and sell animals are not covered. In the absence of an effective quarantine most of the larger owners in infested areas, I feel, would cooperate by permitting inspectors to examine and spray the animals, if appropriate, before moving them into screwworm free areas. The manager of the Puerto Rico Land Authority, which grazes large numbers of beef cattle both on the main island and Vieques, indicated they will be shipping bulls to Vieques in about 6 months. Hopefully, screwworms will be eradicated by this time, however, he was aware of the danger of reinfesting Vieques and plans

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Except for several extended tours of duty by D. E. Hopkins, technician stationed at Kerrville, Texas, colonization and evaluation of several Puerto Rican strains of screwworms, and participation in technical conferences, ARS participation has been rather limited during the 3 years the program has been in operation. Since the program appears to be very effective at the present time and hopefully little field data could be collected, I have no specific studies to propose for ARS, but I believe ARS researchers should keep in touch with the program to benefit from the information obtained and be available for special studies should the need arise.

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A. H. Baumhover
Research Leader

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cc:
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Itinerary

Tues. (May 28)--Arrive San Juan

Wed. (May 29)--Travel to Ponce, meeting Supervisor Sergio Murphy to observe spraying operation between Aibonito and Coamo. Visited Humane Society at Ponce where many infested dogs had been previously infested.

Thurs. May 30)--Travel to Jayuya to observe spraying operation, investigate reported case, and visit other ranches.

Fri. (May 31)--Travel to Roosevelt Roads visiting several ranches enroute near Salinas and Yabucoa. Conferred with Dr. Thompson and Mr. Moring at Program Headquarters.

Sat. (June 1)--Reviewed various program records, met C-130 delivering flies from Mission, Texas (delayed 1 day due to equipment failure).

Sun. (June 2)--Flew in C-7 release aircraft treating "hotspots" in southern half of island.

Mon. (June 3)--Flew in C-7 aircraft to Arecibo to join Supervisor Carmelo Gonzales and deliver flies for ground release on 2 premises infested previous week near Movovis. Visited several additional premises and a test pen maintained by owner containing 5 to 6 untreated newborn calves.

Tues. (June 4)--Investigated case in prolapsed colon of sow. Inspected 5 additional premises recently infested.

Wed. (June 5)--Enroute to San Juan. Inspected 8 premises including a zoo near Vega Alta containing 300 possible screwworm hosts. The Zoologist in charge reported treating many cases previously but has not had an infestation during the past 8 months.

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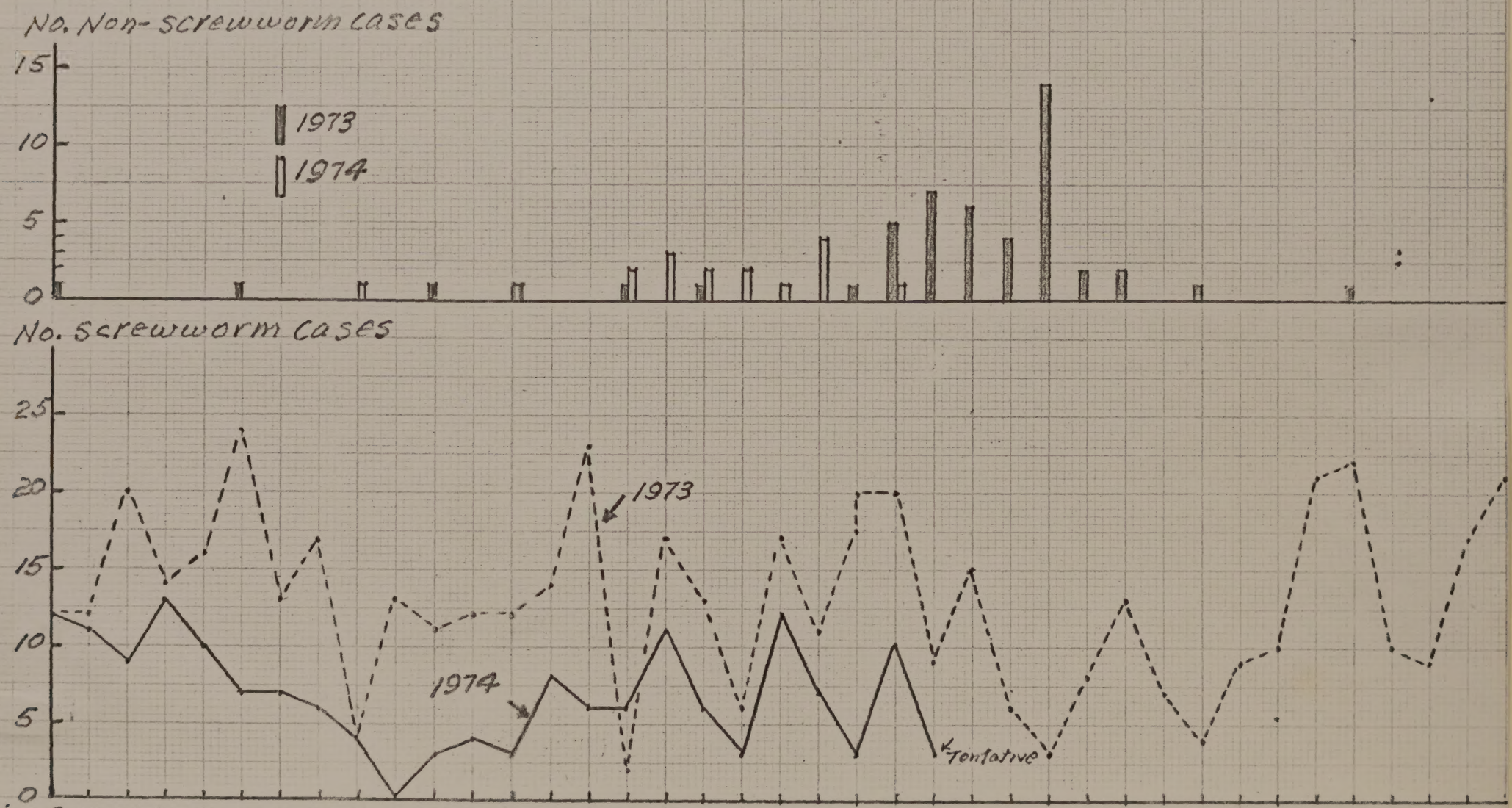
WEEKLY LARVA SAMPLES

Puerto Rico 1973-4

GHL 6/14/7



Mr E A Taylor
W.H.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
~~ENTOMOLOGY RESEARCH DIVISION~~
Southern Region
Tobacco Research Laboratory
Oxford, North Carolina 27565

June 14, 1974

Subject: Current Status of Screwworm Eradication Program in Puerto Rico

To: A. W. Cooper, Deputy Administrator
USDA-ARS-Southern Region
P. O. Box 53326
New Orleans, Louisiana 70153

Thru: G. R. Burns, Area Director
USDA-ARS-Southern Region
N. C. State University
P. O. Box 5847
Raleigh, North Carolina 27607

In response to Dr. R. J. McCracken's inquiry regarding my review of the above program, I spent May 28 through June 6, 1974 in Puerto Rico. This program was initiated in June 1971 and, in addition to Puerto Rico, 17 additional islands in the U. S. and British Virgin Islands were initially treated. Since screwworms no longer exist in the Virgin Islands, sterile releases have been discontinued. Vieques and Culebra, belonging to the Commonwealth of Puerto Rico, have been free of screwworms for about one year but releases are being continued because of their proximity to the main island and the possibility of reinfestation.

For several reasons I believe the optimism for imminent success in the remaining infested area, the main island of Puerto Rico, is amply justified:

1. As of April 1, 1974, adequate ground support has been available with 21 Bio Aids assigned to screwworm and hog cholera programs but concentrating primarily on screwworms under direct control of screwworm personnel. In addition, 9 spray crews of 2 men each (Commonwealth personnel) are on duty. All infested and surrounding herds, excluding swine and lactating dairy cattle, are being sprayed with Coral at 21-day intervals until 6 weeks have elapsed without an infestation.

2. Since March 23, 1974 ground releases of 40,000 flies or more per infested premise have been made weekly, usually within the same week discovered and no later than the following week. Beginning March 17, 1974, about 25% of the 15 million flies allotted to the island have been released strategically by air and since May 5 over 50% have been used in this manner. Currently these releases are being made in 16 problem areas which have had reported and/or confirmed cases during the preceding month. Releases are concentrated in canyons, water courses, near reservoirs and livestock concentrations.

3. Rancher interest has greatly improved since they are now seeing favorable results. Previously, many had become disillusioned and discarded sample kits issued to them. Community leaders are urging their neighbors to submit samples and some have volunteered to help round up and treat their neighbor's infested stock.

4. The western one-fourth of the island has been free of screwworms for over 15 months, the northern plains for 18 months, the Utuado area, previously the most heavily infested, for 9 months and Ponce for 3 months. With the intensive ground support very few of the premises have been reinfested during the past 6 weeks.

5. Although egg mass collections since January 1, 1974 have been quite low, a total of only 17, 88% have been sterile in contrast with a similar period in 1973 when only 12% of the 242 masses were sterile. The low number of egg masses collected in 1974 can be attributed partly to termination of test pens and partly to the apparently low native populations.

6. Since August 1, 1973, logistics of transport and release of flies has been vastly improved. The Air Force Reserve flies non-stop from Mission, Texas to Roosevelt Roads on Friday, the flies emerge Saturday and are aerial-released on Sunday and Monday with ground releases being made on Saturday. Thus the flies are released promptly after emergence with only the flies for the Monday release subjected to chilling at 65° F for 24 hours or less. Previously, the insects were under chill up to 10 days which did not seriously affect emergence or longevity in the laboratory but greatly reduced activity in the field based on recent tests by APHIS at Mission, Texas. In addition, the Tex-Mex strain of flies, apparently more competitive than previous strains, is currently being released.

7. I personally observed 207 susceptible animals in herds that had been recently infested. Only one of these was infested with screwworms. Fortunately, the 2 egg masses collected from the same wound were sterile.

Barring unforeseen breakdowns, it appears that the program is now in a "mopping" up operation to eliminate the few isolated infestations still occurring. Further comments follow:

1. Program Personnel

Dr. Kenneth R. Thompson is in charge of the program supported by Carmelo Gonzales supervising field activities in the northern half of the island with Sergio Murphy in the southern half. Along with Douglas Moring, temporarily in charge of the Distribution Center, an excellent team has been available since April 1, 1974 to conduct the program. All of these men are highly enthusiastic, capable and not only determined but confident that the program will succeed. Unfortunately, Moring was recalled recently to his permanent duty station. Unless he is able to return or an experienced replacement is found I believe the chances of success will be greatly reduced. Handling of the flies for release is critical and requires experience and judgment.

2. Headquarters Activities

A. Fly distribution.--Adequate facilities are available for emerging and holding the flies. When flies are in storage, personnel are constantly on duty to maintain optimum temperatures and to intercept power or equipment failures which may result in loss of the insects. Flies

were in optimum condition during the releases I witnessed on the 2nd and 3rd of June. Checks inside the loaded plane indicated no rise in temperature in the release cartons. All of the hotspots scheduled for release were adequately covered. Flies delivered for ground release were in excellent condition and showed no signs of being overheated. The only disturbing question was fate of the flies after the cartons left the release chute. There was no consistent pattern in behavior of the cartons; some sailed out gently and opened as desired. Others twisted rapidly and some appeared to "explode". It was impossible to judge whether the flies were being injured but this may be possible with binoculars and/or a high-speed movie camera with a telephoto lens. Under certain conditions cartons failed to open but the dispersers have been instructed to open the rear flap to correct this situation.

B. Confirmation of cases.--Larva samples are being tentatively identified at the distribution center to permit prompt treatment of infested premises. Samples are subsequently submitted to Beltsville, Maryland for verification. Errors in identification would be rare since a high percentage of the samples currently are screwworms and only small or deteriorated specimens would be difficult to identify. The advantages of prompt treatment of infested premises would far outweigh possible errors in the initial identification.

C. Communication.--Field supervisors are in continual contact with headquarters to report cases detected in the field so that special

releases may be scheduled promptly. Information on positive samples received at headquarters are relayed to the field to permit prompt investigation and arrangement for spraying eligible, infested herds. Since telephone facilities are limited in certain areas, use of radio-equipped vehicles should be investigated.

D. Publicity.--Various radio and TV spots have been used to publicize the program. Four meetings with major livestock producers, arranged by local extension agents, have been held by Dr. Thompson and Mr. Gonzales and more are scheduled.

3. Recent Case Incidence

From March 31 through June 7, 1974 only 72 screwworm cases were detected compared with 143 during a similar period in 1973 for a reduction of 50%. With increased surveillance during this period in 1974, due to the presence of 21 Bio Aids, 9 spray crews and improved grower interest, reporting undoubtedly has increased. Using the non-screwworm samples as an index, 7 in 1973 and 15 in 1974, surveillance was 2.14 times greater in 1974 than in 1973. Total cases confirmed in 1973 likely would have been 306 (143 X 2.14) with the same level of surveillance as in 1974. On this basis the reduction in 1974 would have been 76.5% (306 - 72 = 234; 234 ÷ 306 = 0.765 or 76.5%) rather than the 50% actually recorded.

4. Problem Areas

In some areas livestock are of secondary importance and personnel and facilities to handle the stock are limited. As an example, a

2000-acre coffee plantation near Jayuya pastures 60 head of beef cattle which are extremely wild and normally handled only when rounded up for sale. The foreman had reported a screwworm case recently and agreed to pen the animal for inspection. Workers on foot spent 2 hours attempting to confine the animal but were unsuccessful. Inspector Murphy later obtained the promise of the owner that the entire herd would be rounded up for spraying. In another situation near Vega Baja, the spraying operation was thwarted when the corral collapsed. Certain areas in the interior are accessible only with 4-wheel drive vehicles, horseback or on foot. Attempts are being made to obtain the needed vehicles. During the first 17 weeks of 1974 dogs had been responsible for 12% of the 120 cases reported. These have been primarily stray dogs received by the Humane Society at Ponce. Fortunately this area has been free of screwworms for the past 6 weeks following special releases. However, the many stray dogs previously reported at the city dump remain a potential hazard.

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free area. If the released flies also are reluctant to disperse into favorable habitats this may partly explain the lack of success previously in certain areas. This tendency is supported by the results of ground releases initiated in late March 1974. Few premises treated since that time have had repeat infestations. It might be argued that spraying infested herds has been responsible for cleaning up these areas but this would not apply to swine and lactating dairy herds which are not sprayed.

8. Spraying Operation

Although some owners were reluctant at first to round up their herds for spraying to control screwworms, the additional benefits of horn fly, tick and cattle grub control has created a great demand for this service. Incidentally, cattle grubs apparently are present only in cattle recently imported from the United States or Canada and have not been able to reproduce on the island. The adults are short-lived and females may not be able to find mates under low population densities. Three spraying operations were observed and in all instances thorough coverage of the animals was obtained. Rounding up livestock invariably induces additional wounds, however, from the standpoint of screwworm control this should be an advantage since these would act as "trap" wounds causing the female to oviposit where chances of survival of the larvae would be negligible. The spraying operation also has the advantage of making large numbers of animals available for close inspection and collection of larva and

egg mass specimens. At my suggestion, Dr. Thompson has agreed to have the Bio Aids and spray crews report the number of susceptible wounds not infested. Lack of infestation in these wounds would verify that fertile-mated native females were non-existent or at a very low population level.

9. Fly Trapping

Based on results in the primary problem area in Broward County, Florida, during the Southeastern Eradication Program, 1958-59, I had recommended that liver-baited traps be used in problem areas in Puerto Rico. During a 4-week period 38 traps (1 per sq. mi) captured 216 native females. During the same period 5 to 7 livestock inspectors were able to detect only 73 screwworm cases. Traps were operated earlier this year in Puerto Rico at Carolina and Caguas but were discontinued when the men involved were transferred to other duties. If the program continues to be successful traps may not be needed, but on premises having repeat cases I would suggest operating 1 to 2 traps per sq. mi or at least 1 trap on small premises. Traps would need servicing only every week or two depending upon evaporation of the liquid and consumption of the liver by insect larvae. If the screwworms weredissected to separate native from released females it would be necessary to collect every 2 or 3 days. This information would be of value but merely using the traps for control and discarding the catches would greatly simplify the operation.

10. Ecological Conditions

Except for the area between Aibonito and Ponce, Puerto Rico appeared to be receiving abundant rainfall and I saw no other areas in which adverse weather might be an important factor in suppressing screwworms. Wild hosts apparently are of minor concern since the deer population had been removed previously during a tick eradication program.

11. Quarantine

Considerable movement of livestock occurs within the island, transporting animals for slaughter and moving dairy cattle to and from pastures where dry herds are maintained. Several screwworm infestations have been detected in animals recently transferred which could complicate the final phases of the program by increasing the number of areas requiring special treatment. Puerto Rico has a statute to control movement of livestock by owners, but dealers who buy and sell animals are not covered. In the absence of an effective quarantine most of the larger owners in infested areas, I feel, would cooperate by permitting inspectors to examine and spray the animals, if appropriate, before moving them into screwworm free areas. The manager of the Puerto Rico Land Authority, which grazes large numbers of beef cattle both on the main island and Vieques, indicated they will be shipping bulls to Vieques in about 6 months. Hopefully, screwworms will be eradicated by this time, however, he was aware of the danger of reinfesting Vieques and plans

to treat any wounds before shipping. In addition, spraying, a standard quarantine procedure, would be desirable because of the difficulty in detecting egg masses and small larvae.

Prior to completion of the program a survey of the various Caribbean Islands should be made as a basis for establishing an effective quarantine. Some information is available but is not recent enough to be reliable. M. T. James, (USDA Misc. Pub. No. 631, Sept. 1947, "The Flies That Cause Myiasis in Man") lists Cuba, Haiti, Dominican Republic, St. Lucia and Trinidad. Screwworms might well be present on some of the other islands not listed, particularly the large island of Jamaica.

12. ARS Participation

Except for several extended tours of duty by D. E. Hopkins, technician stationed at Kerrville, Texas, colonization and evaluation of several Puerto Rican strains of screwworms, and participation in technical conferences, ARS participation has been rather limited during the 3 years the program has been in operation. Since the program appears to be very effective at the present time and hopefully little field data could be collected, I have no specific studies to propose for ARS, but I believe ARS researchers should keep in touch with the program to benefit from the information obtained and be available for special studies should the need arise.

Attached is a graph showing screwworm and non-screwworm samples received January through September 1973 and January through June 15, 1974. The

3 cases recorded for the week ending June 15, 1974 are tentative since they had arrived late in the week and no one qualified to identify them was on duty at the time I had called for the information. The graph is not very impressive unless one considers the significant increase in surveillance by 21 Bio Aids, 9 spray crews and many interested growers. Also attached is my itinerary.

A. H. Baumhover

A. H. Baumhover
Research Leader

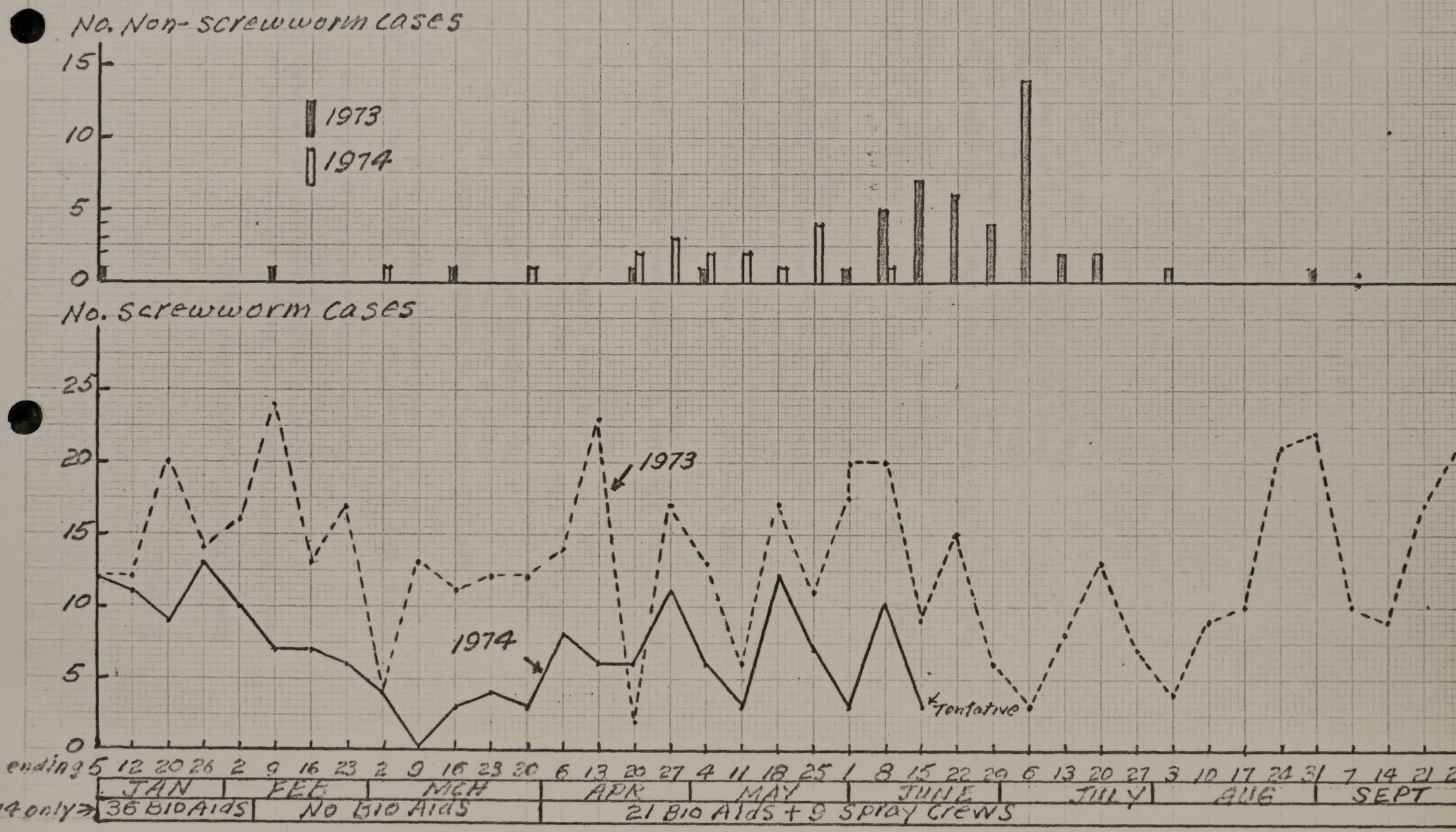
Attachments

cc:
J. F. Chaplin
L. S. Henderson
R. J. McCracken
D. L. Williams

WEEKLY LARVA SAMPLES

Puerto Rico 1973-4

GHL 6/14/7



Itinerary

Tues. (May 28)--Arrive San Juan

Wed. (May 29)--Travel to Ponce, meeting Supervisor Sergio Murphy to observe spraying operation between Aibonito and Coamo. Visited Humane Society at Ponce where many infested dogs had been previously infested.

Thurs. May 30)--Travel to Jayuya to observe spraying operation, investigate reported case, and visit other ranches.

Fri. (May 31)--Travel to Roosevelt Roads visiting several ranches enroute near Salinas and Yabucoa. Conferred with Dr. Thompson and Mr. Moring at Program Headquarters.

Sat. (June 1)--Reviewed various program records, met C-130 delivering flies from Mission, Texas (delayed 1 day due to equipment failure).

Sun. (June 2)--Flew in C-7 release aircraft treating "hotspots" in southern half of island.

Mon. (June 3)--Flew in C-7 aircraft to Arecibo to join Supervisor Carmelo Gonzales and deliver flies for ground release on 2 premises infested previous week near Movovis. Visited several additional premises and a test pen maintained by owner containing 5 to 6 untreated newborn calves.

Tues. (June 4)--Investigated case in prolapsed colon of sow. Inspected 5 additional premises recently infested.

Wed. (June 5)--Enroute to San Juan. Inspected 8 premises including a zoo near Vega Alta containing 300 possible screwworm hosts. The Zoologist in charge reported treating many cases previously but has not had an infestation during the past 8 months.

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
P. O. BOX 232
KERRVILLE, TEXAS 78028

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✓ WFS wfs
JE J
NC

January 10, 1975

Subject: A report, "Sterile Male Technique: Its Application on Screwworms in the Puerto Rican Area"

To: R. O. Drummond, Location and Research Leader
U. S. Livestock Insects Laboratory
ARS, USDA, Kerrville, Texas

RODrummond

The writing of the enclosed report was undertaken with the determined aim of producing a publishable research paper. However, when it was finished it was evident to the reviewers to which it was submitted, and to the author, that the report did not contain sufficient data to substantiate the majority of the points that were developed.

In reality, then, the report is primarily a statement of a point of view. If the reader keeps this in mind, the effort may still prove to be of some value to those using the sterile-male technique on screwworms, and the report is submitted with this hope.

D. E. Hopkins
D. E. Hopkins
Biological Lab Technician

cc: J. L. Hourrigan
J. R. Johnston
R. C. Bushland
E. A. Taylor
D. L. Williams
V. C. Beal
A. H. Baumhover
B. G. Hightower
R. R. Gerrish
A. J. Graham
M. E. Meadows

J. D. Kopec
K. R. Thompson
Norvan Meyer
Wendell Snow
Lyman Henderson
Waldemar Klassen

O. H. Graham
R. L. Harris
D. E. Wiedhaas
E. F. Knipling

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Sterile Male Technique: Its Application on Screwworms in the Puerto Rican Area

by

D. E. Hopkins
U. S. Livestock Insects Laboratory
Agr. Res. Serv., USDA
Kerrville, Texas 78028

INTRODUCTION

A program of sterile-fly releases, designed to eradicate the screwworm, Cochliomyia hominivorax (Coquerel), was carried out in the commonwealth of Puerto Rico and in several of the U. S. and British Virgin Islands. The program was operated jointly by the U. S. Department of Agriculture (APHIS) and the U. S. Air Force.

Knipling (1972) theorizes that during a parent generation, a ratio of 9 to 1 of sterile to wild insects would result in 90% control of the reproduction of that generation. He further theorizes that if each generation of wild insects was capable of a 5-fold increase and if the numbers of sterile insects present during the P generation were present during the F_1 generation, the ratio of sterile to wild during that F_1 generation would be 18 to 1. If this process continued, by the F_4 generation no reproducing insects would remain.

Numbers of sterilized screwworm flies that were estimated to outnumber the wild populations by at least 9:1 were released each week (400-22,000 flies (both sexes)/mile^2) from July 1971 to July 1972 (sufficient time for about 16 generations). However, during this period none of the native fly populations were eradicated. (There are no data that show the actual ratio of released to wild flies. However, for screwworms, even 200 or 300/mile^2 is considered by observers to be a dense population. A release of 22,000 flies would outnumber a wild population of 300 by about 73 to 1).

In general, the 5-fold increase per generation included in Knipling's theory would not have applied on a continuing basis to those populations in the Puerto Rican area. The populations there were long-established and therefore, according to general theory, were not increasing but were, over the long term, maintaining themselves at mean levels. Presumably then, those populations should have succumbed readily to the sterile-male technique. In theory, stable or declining populations should be more susceptible to suppression than expanding ones since the factor of a certain increase per generation would not apply.

There probably were multiple reasons for the difficulties encountered in the attempts to eradicate those populations, and the vigor and the genetic makeup of the sterilized fly are factors that must be considered. But the densities of the native populations and their reproductive capacities were also probable factors; the following is an attempt to examine the role that they played.

DISCUSSION

Screwworm Characteristics. Screwworms are important obligate parasites of various terrestrial mammals, including man (Baumhover 1966). The female screwworm fly lays its eggs on any wound or broken skin of warm-blooded animals. The eggs hatch in a matter of hours, and the tiny larvae burrow into the flesh, creating holes or pockets. As the larvae grow, the suppurating wound is enlarged and becomes more attractive to flies (Linduska & Lindquist 1952). Usually within a week after hatching, the larvae become fully grown, drop from the wound, and pupate. During warm weather, the adults emerge after about a 7-day pupal period, mate at about 3 days of age, and the females become gravid at 5 to 7 days of age.

A typical screwworm female is capable of laying at least 200 eggs/egg mass and can be expected to lay several egg masses during her lifetime (Bruce 1952).

Baumhover (1966) observed that the distribution of screwworms is restricted during winter months to tropical and subtropical areas of North and South America. (The Puerto Rican area is tropical, and there natural or other forces ordinarily never disrupt the screwworm life cycle).

Theory of Screwworm Reproduction. When the density of a population of screwworms is stable and the females lay 200 eggs/♀, then screwworms from only 1% of the eggs eventually become reproducing adults; an accumulative 99% of them do not survive the egg, larva, pupa, and preovipositing adult stages. Data are not available that show the average mortality that, at given conditions, occurs at each stage of the screwworm life cycle, but when we assume that, on the average, 32% of each stage survives, then from a population of 100 parent females that laid 200 eggs/♀, 210 F_1 adults would complete the reproductive cycle. (Whenever actual survival rates equal those hypothetical ones, an induced sterility rate of 68% among egg masses would only equal the natural mortality of those eggs.)

Theory of Screwworm Population Densities. Where indigenous populations exist, their densities are necessarily the result of prevailing conditions. The natural forces that are not associated with the insect per se and that act to keep populations from continually

If there are 200 eggs/mass and several masses per female the assumption of 200 eggs/♀ is not valid

expanding could be described as natural population depressants. Conversely, such conditions that keep populations from continually decreasing could be described as natural population assistants.

When an introduced factor depresses the usual density of any given stage of a populations, but natural population assistants remain unaltered (the case when sterile males cause the average number of viable eggs in a population to be lowered), then for all the stages, supportive conditions necessarily remain that would allow for a population of the original size. Accordingly, therefore, in any given situation, depressing the average number of viable eggs necessarily depresses the average number of larvae that subsequently complete development only if the resulting number of viable eggs is below the average number of larvae that conditions ordinarily support.

In a given situation, the actual sterility rate among egg masses that depresses the average reproductive capacity of a screwworm population can be determined only by experimentation, unless, of course, the value of each force acting on the population is known. But, where natural population assistants are abundant, the sterility rate among egg masses that would result in a lower than expected number of fully-grown larvae could be expected to be high (> 80%).

Sterile Fly Release on Vieques, P. R. March 4 - April 8, 1972, 22,000 sexually sterile screwworm flies (both sexes)/mile^2 per week were released on the island of Vieques. March 5 - April 11, collections of screwworm egg masses from screwworm wounds on animals in 3 pens on Vieques averaged 7, 19, and 29/pen per week. The respective average sterility among those egg masses was 65, 46, and 21% per week. The population density, according to egg mass deposition rates, did not decrease during the period; the weekly rates per pen in respect to the average sterility rates were 4, 2, 4, 8, 11, and 10; 13, 7, 15, 5, 57, and 14; and 20, 26, 22, 44, 37, and 24.

Why there was no decrease in population density is not definitely understood. However, the number of larval breeding opportunities presumably influences greatly the ability of a screwworm population to reproduce. Many potential screwworm wounds were constantly available on Vieques. The navels of baby calves are very susceptible to screwworm infestation (Bruce 1952). At least 2250 (number branded) calves were born on a 26-mile^2 tract on the eastern end of Vieques (site of the pen that averaged 29 egg masses/week) during 1972, an average 1.66 calves/mile^2 per week. In that area the average sterility rate of egg masses was 21%, and the average number of egg masses/pen per day was 4.1. That sterility rate would not likely have reduced the mean number of natural infestations of the navels of baby calves or of any other potential screwworm wounds in the area. Where an average 4.1 masses/wound per day are laid, the sterility among those masses should be 87.8% (1 of 8.2 fertile) if each potential wound that is attractive for 1 day is to receive a 50% chance of

remaining free of infestation. These calculations would not hold true if the calf navels or other wounds were unequal in attractiveness to the wounds on the penned animals. Unfortunately there are no data available regarding comparative attractiveness of wounds. However, observers generally agree that the navels of newly born animals are very susceptible to screwworm infestation (Bruce 1952). Also, data show that on Vieques, calf navels afforded prime screwworm breeding opportunities. Over a 73-day period in 1973 (January 8 - March 22) 53 baby calves were examined at random; 12 had navel cases, and the navels of 20 had recently been infested (an infestation rate of 60%).

The maintenance of a population at a given average density depends only on the completion of the reproduction cycle of 200 eggs/100 parent females. It would thus follow that, regardless of the density of the screwworm population or of the infestation rate among calves, if the natural mortality rate and the induced sterility rate of egg masses did not account for more than an accumulated 99% of the eggs, larvae, pupae, and young adults of each generation, the population density could be maintained. This factor might explain why the population density did not decrease in that 26-mile^2 area during the period.

The low sterility rates might have resulted from a low degree of competitiveness for mates on the part of the released fly. V. C. Beal (Veterinary Services, APHIS, Hyattsville, Md. 20782, personal communication) and A. H. Baumhover, (Tobacco Research Laboratory, ARS, Oxford, N. C. 27565, personal communication) have estimated that the ratio of sexual competitiveness among males of the various genetic strains involved varied from 8:1 to 80:1 in favor of the wild fly.

RESULTS

The screwworm population on Vieques was eventually eradicated about July 1973. At that time, the prevailing release rate was 20,000 flies/mile^2 per week, observed sterility rate among wild egg masses was about 80%, and a strenuous program to depress the population density in the larval stage was in effect (wounds were treated). Also, severe drought conditions (which presumably were detrimental to that screwworm population) existed, and the rate of calf production was lowered because the cattle were starved and debilitated as a result of the drought.

The screwworm populations that were treated, with the exception of the one on the island of Puerto Rico, were eradicated prior to 1974. However, in each case prophylactic livestock sprays and curative wound treatments were used to supplement the effect of the sterile males.

CONCLUSIONS

In the Puerto Rican area, the release of sterile screwworm males affected, for long periods, the fertility of the eggs of the wild screwworm populations but did not result in eradication until supplemental control measures were employed. This result is evidence that, as applied, the technique alone was not sufficient (fly quality and origin of the released fly notwithstanding) to cause eradication in that area. It was also evident that inherent factors, i.e., the densities of the native populations and the environmental conditions which were conducive to high reproductive capacities of the native populations, were important contributing factors to that insufficiency.

The use of sterile males as instruments or tools that affected the reproductive capacities of screwworms and therefore contributed to the eradication of indigenous screwworm populations had previously been demonstrated several times (Baumhover 1966). Generally, however, there are limits to the practical effective application of any tool, and the factors that limit the use of the sterile male technique as applied to screwworms are not well defined.

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UNITED STATES DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
VETERINARY SERVICES
FEDERAL CENTER BUILDING
HYATTSVILLE, MARYLAND 20782

Subject: Draft of Paper Entitled "The Eradication of Screwworms from Puerto Rico and the Virgin Islands

August 1, 1975

To:
G. V. Peacock
N. L. Meyer
M. J. Tillery
R. C. Bushland
A. H. Baumhover
W. Snow
M. E. Meadows

We are enclosing a copy of what we hope is "one of the later drafts" of subject paper for your information. We invite your comments and suggestions.

Inasmuch as the reader audience will be made up largely of persons not familiar with screwworms or the eradication program, we went into more detail in certain aspects then one would do ordinarily. Our overall objective was to inform the Journal of American Veterinary Medical Association readers about the program and its success and at the same time pointing out the dominant role played by sterile flies and the value of ground support activities.

Would appreciate receiving your comments and suggestions by August 15, 1975.

J. L. Hourrigan
Senior Staff Veterinarian
Sheep, Goat, Equine, and
Ectoparasites Staff

Enclosure

8/1/75

REDRAFT:DLWilliams:kmc:smc 8/1/75

THE ERADICATION OF SCREWWORMS FROM PUERTO RICO AND THE VIRGIN ISLANDS

Donald L. Williams, D.V.M., M.P.H.; Solomon C. Gartman, D.V.M.; James L. Hourrigan, D.V.M.

BACKGROUND

The screwworm (SW) is the larval stage of the fly Cochliomyia hominivorax (Coquerell). This is an obligatory parasite in which the adult female oviposits on wounds of live warm-blooded animals, including man, causing myiasis.[1a/] The eggs may be placed on any type wound or abrasion and hatch in 11 to 21 hours. The larvae eat into the tissues and complete development takes place in 5 to 7 days. They then leave the wound and burrow into the soil, where the outer surfaces harden and form pupae. In 7 to 10 days, the adult flies emerge. The females mate about 2 days later and in 6 days may begin to oviposit. The usual life cycle is 3 to 4 weeks, with the adult fly living 10 to 14 days. In cool weather, the pupal stage may persist for 2 months. The male and female adults feed on nector and pollen. The female obtains protein from animal wounds.

Screwworms are not found in cold-blooded animals or in the carcasses of dead animals. Maggots found in such locations are larvae of common blowflies.

C. hominivorax are found only in the Western Hemisphere. Their climatic range includes Southern United States, Central America, the Caribbean Islands, and South America, as far south as Argentina. During winter, freezing weather eliminates the pest; however, during warm weather, the insect spreads in great numbers into more temperate climates. The adults have been observed to fly up to 180[5/] miles and the larvae may be carried great distances when infested animals are transported by vehicle or aircraft.

Chrysomyia bezzinana, the Old World SW Fly, is similar to C. hominivorax, but is found only in Africa and the orient.

When Dr. D. F. Knipling first proposed the use of laboratory-reared sterilization male SW flies as a tool for insect control or eradication in 1938, it represented a dynamic departure from the known methods of insect control with the use of chemical pesticides.[6] He later developed a theoretical model of population reduction in subsequent generations following release of an overwhelming number of sterile insects into a given population. It was theorized that in four generations, the normal reproduction would be eliminated. A practical application of this theory became possible after it was learned that gamma radiation could be used to sterilize the insect. Exposure of 6-day old SW pupae to 6,000 r gamma radiation sterilized both sexes and prevented oviposition by the female.[7] The female adult normally mates but once and, if mated to a sterile male, the eggs do not hatch, making the fly incapable of reproducing.

The sterile male fly release technique was used to eradicate SW in 1954 from Curacao, a 170 square mile island in the Caribbean. In 1959, using the same general methods, SW were eradicated from Florida and the Southeastern United States. The insect usually overwintered in about 50,000 square miles of southern Florida, spreading into Southeastern States each year during favorable climatic periods of spring and fall.

In this program, the principal tool of eradication was also the sterile male technique. In February 1962, the production and aerial release of sterile SW flies began in an effort to eliminate SW from Texas, New Mexico, Oklahoma, Louisiana, and Arkansas. By February 1964, overwintering populations of SW flies had been eradicated from these five States. In both the Southeastern and Southwestern Screwworm Eradication Programs, the sterile male technique was reinforced by conventional animal disease eradication techniques, such as inspections of livestock, spraying livestock with insecticides for prevention and treatment, hand treatment of wounds with livestock powder or smears, control of animal movements, and a strong public information program to obtain cooperation of livestock owners.

Overwintering populations of SW were eradicated from California by March and from Arizona by April 1966; thus freeing the entire United States from overwintering populations of SW. Following this accomplishment, a barrier of sterile flies was established along the United States-Mexican border from the Pacific Ocean to the Gulf of Mexico to assist in protecting livestock in the United States from migrating populations of fertile SW flies from Mexico.

A cooperative program between the United States and Mexico is now getting underway. The goal of this program is to push native SW populations southward from the present 2,000-mile long barrier zone, along the U.S.-Mexico border, to a new and shorter barrier at the Isthmus of Tehuantepec.

It was observed that Puerto Rico and the United States Virgin Islands were the only parts of the United States territory where SW continued to be a serious problem. Prior to the start of the eradication program, SW infestations cost the consumer and the livestock producer an estimated $2 to $2.5 million per year. These losses were the result of weight losses and carcass damage at slaughter of screwworm-infested animals, cost of medications for treatments, death losses, damage to hides, and cost of husbandry labor. Cases in humans were occasionally reported.[4] Puerto Rican animal health officials and officials of various livestock producer organizations requested that the Animal Health Division of Agricultural Research Service (ARS) enter into a cooperative program with them which could lead to the eradication of SW from Puerto Rico. Experience to be gained in eradicating SW from a tropical environment such as Puerto Rico with a high density of livestock would also provide valuable experience which could be applied in the tropical regions of Mexico, where SW eradication will soon be undertaken.

Because SW flies could readily fly distances to and between some of the Virgin Islands, and as they could be introduced on infested livestock carried on boats coming from other infested islands in the Caribbean, the nearby U.S. Virgin Islands and the British Virgin Islands were included in the eradication program. This would insure that Puerto Rican livestock would not be easily exposed to reinfestation by wild fertile flies from the nearby Virgin Islands.

It was not possible to determine when SW first invaded Puerto Rico. No doubt the parasite had been present for considerable time. It was considered possible that the isolated populations of SW flies could have evolved to the extent that the Puerto Rican strain of flies might not mate with sterile insects developed from mainland strains. To check this possibility, ARS scientists made three collections of Puerto Rican SW which were tested in ARS laboratories at Mission, Texas.[1b/] These tests, conducted in small cages in the laboratory, proved that the sterile males being produced at Mission did effectively mate in with native Puerto Rican female SW flies. The program was based on the assumption that sterile males released from airplanes over Puerto Rico would mate in the field with native Puerto Rican female flies as they had done in the laboratory. These gravid females would lay their eggs on animal wounds, and the resulting eggs would not hatch. For the program to work effectively, sterile males must outnumber native males and must also be able to compete successfully with native males for the opportunity of mating with the native females flies. The continued release of sterile flies was designed to bring about the reduction and ultimately the eradication of native SW flies in the area. Livestock in Puerto Rico is made up of the following species:

SCREWWORM HOST POPULATIONS OF PUERTO RICO
1966 CENSUS

Cattle:	550,000
Swine:	200,000
Horses:	14,000
Goats:	10,000
Sheep:	500
TOTAL	774,500

Puerto Rico is about 3,500 square miles in area. This represents about 225 domestic livestock per square mile, not including the domestic and feral dog population. When considering the land used for crops and the cities and towns, the number of animals per square mile is even higher. The climatic conditions in this tropical area are very conducive to SW survival. This along with the large number of potential hosts (wounds) made the eradication job much more difficult.

ROLE OF THE U.S. AIR FORCE

The U.S. Air Force provided support for aerial release of sterile flies for the program on Puerto Rico and the Virgin Islands. Personnel of the U.S. Air Force Special Air Warfare Center (TAC) at Eglin Air Force Base, Florida, together with U.S. Air Force Headquarters personnel, based at the Pentagon, Washington, DC, cooperated with the U.S. Department of Agriculture, the Commonwealth Government of Puerto Rico, and the Governments of the U.S. and British Virgin Islands in the design and the planning of the SW eradication program in Puerto Rico. The Air Force was interested in the SW eradication program because one of the missions of the Special Air Warfare Center was the application of modern techniques and air power to assist other governments in solving problems with the proper application of aircraft. This program was similar to other successful programs that the Air Force has undertaken, in different countries throughout the world. In July 1973, the Air Force group at Eglin Air Force Base was replaced by units from the U.S. Air Force Reserve, who became responsible for the aerial operations of the program until the final fly release activity on May 3, 1975. All Air Force participation was characterized by an extremely high level of professional competency and safety. Without Air Force cooperation, this successful program would not have been a reality.

STRAINS OF FLIES

In June 1971, the program in Puerto Rico and the surrounding islands was initiated, using a "Mexican strain" of fly being produced at the Mission, Texas, plant on a semi-solid diet which included nutria. In September 1972, released flies were changed to a mixture of a "Texas strain" and a "Puerto Rican strain." During 1973, these two strains varied in quantity, but the Puerto Rican strain only was released on the island of Vieques until January 1974. At that time, the Puerto Rican strain was discontinued and the "Tex-Mex strain" only was used until replaced with the "FF-8 strain" in February 1974. The "Tex-Mex strain" was developed with flies collected from Mexico and the United States The "FF-8 strain" was developed from later field collections. It should be noted that SW were eradicated from the British-American Virgin Islands and the island of Culebra while the Mexican strain was used. The island of Vieques and perhaps Mona were eradicated while the Puerto Rican strain was being used. The western portion of Puerto Rico was freed of SW with a mixture of Tex-Mex and Puerto Rican strains.

STERILE FLY RELEASE OPERATIONS

Sterile SW flies were produced at the Sterile SW Fly Production Plant located at Mission, Texas, and operated by the Veterinary Services of Animal and Plant Health Inspection Service.

Beginning in June 1971, the irradiated pupae were packed in trays and racks contained in a large environmental chamber chilled at 45° to 55° F and shipped via C-123 aircraft operated by the U.S. Air Force. The flights from Mission to Ramey Air Force Base, at the northwest corner of Puerto Rico, took from 14 to 16 hours, excluding stops for fuel and crew changes. Pupae were packaged at Ramey AFB, held until the adult flies emerged, and were dispersed by small single engine U-10 aircraft. The payload was relatively small, about 150 boxes per sortie. For most of this period, 2.5 million pupae were shipped on a weekly basis. This quantity was increased to 5 million in September 1972 and further increased to about 15 million in February 1973. During the period when 2.5 million pupae were being airlifted, SW were eradicated from the United States and British Virgin Islands as well as the Puerto Rican Commonwealth island of Culebra, lying 26 miles off of the eastern coast of the main island. A similar neighboring island, Vieques, 9 miles off the eastern coast was free of SW by July 1973. During some periods,up to 22,000 sterile flies per square mile were distributed over Vieques. Mona Island, 45 miles due west of the western coast, is also free of infestation. Screwworms were believed eradicated from the western quarter of Puerto Rico during the first 28 months of the program.

Starting in July 1973, the transporting aircraft C-123 was replaced by the faster and longer ranged C-130 aircraft and sterile pupae were shipped to Puerto Rico already boxed. Pupae were selected so that only a few flies emerged on the 6 1/2 hour direct flight to Roosevelt Roads Naval Base in eastern Puerto Rico. This flight usually was made on Friday of each week. The aircraft was pressurized to 5-7,000 feet and the flies held in temperature controlled conditions to preserve fly quality during transportation.

Upon arrival at the distribution center, the dispersal boxes were placed in a modular air-conditioned chamber maintained initially at 78-80° F. When 90 percent emergence had occurred, the temperature was lowered to 65-68° F. Distribution of these flies commenced erarly the following morning. Two C-7A craft, each loaded with about 3.5 million flies per sortie, distributed flies on the predetermined flight lanes and on special areas as directed. Any flies remaining were held at 60-65° F, until released. They were released later in the day or on subsequent days.

Careful examination of the condition of the flies was conducted at each stage of this operation. Since July 1973, fly quality improved with higher percentage of emergence and an apparent increase in longevity. Quality control tests were made routinely to moniter fly quality. During most of 1974, 14.5 million sterile flies per week were released over Puerto Rico and Vieques. About 10.5 million flies were dropped on the lanes, resulting in a release rate of slightly more than 3,000 sterile flies per square mile. The island was transected longitudinally by 16 lanes, 2-miles apart. These lanes were bisected every other week. Special drops over

outbreak areas required an additional 3.5 to 4 million flies per week. Ground releases also were made in canyons and at the base of mountains in order to insure that sterile flies reached these areas.[3/] Air Force personnel developed special fly release equipment to insure that the required numbers of sterile flies were released over infested areas. This equipment included an electronic counter which counted each box of sterile flies released and registered these numbers in the cockpit of the C-7 so that the pilot knew exactly how many boxes had been released at any time.

During the program, sterile flies were released as follows over Puerto Rico, Vieques, and the Virgin Islands:

DATE	FLIES RELEASED
June 1 - December 31, 1971	77,600,000
January 1 - December 31, 1972	180,860,000
January 1 - December 31, 1973	701,440,700
January 1 - December 31, 1974	722,400,000
January 1 - May 3, 1975	169,008,000

SCREWWORM CASE DETECTION EFFORT

There was no efficient lure to attract SW flies into fly traps. To date, the best such attractant available was decomposed liver. It attracts only the female SW fly. This lure was not specific for SW flies in that it attracted several hundred ordinary blowflies for every SW fly caught. This made identifying trapped flies a laborious task. Likewise, there was no efficient way to measure the wild populations of SW nor the behavior and efficiency of the released flies in the field. The best practical method to measure program efficiency was by the number of laboratory-confirmed SW cases. Reports of cases unaccompanied by larval samples from the wounds were not given full credence. Only those case reports of myiases

accompanied by larval specimens were considered when determining SW incidence. At least 75 percent of the SW samples in 1974 were collected by Puerto Rican or United States livestock regulatory personnel. The remainder were obtained by owners or their employees.

SCREWWORM CONFIRMED SAMPLES
(including fertile egg masses)

CALENDAR YEAR	PUERTO RICO (inc. Vieques, Mona, and Culebra)	U.S. VIRGIN ISLANDS	BRITISH VIRGIN ISLANDS
1971	1,833	94	13
1972	2,240	2	16
1973	1,303	-0-	-0-
1974	168	-0-	-0-
1975	-0-	-0-	-0-

The last case of SW in Puerto Rico was reported on November 5, 1974. As the program progressed, the reporting of nonscrewworm samples was used to evaluate the efficiency of the SW case detection system in Puerto Rico. In the first 6 months of calendar year 1975, there were no SW cases reported but there were 15 laboratory-confirmed nonscrewworm cases. Continued vigilance has failed to reveal evidence of any additional SW cases in Puerto Rico.

PROBLEMS

There were three major problems facing the program during the first 2 years of fly release. These problems involved fly quality, ground support activities, and public information.

The first problem involved the delivering a good quality of sterile flies for release over Puerto Rico. Apparently, the logistic difficulties involved in hauling the flies from Mission, Texas, to Puerto Rico in a nonpressurized and non-air-conditioned and slow-flying aircraft of limited range was damaging

to the pupae. Accumulation of heat generated by their own metabolism probably caused the most serious damage. This was further compounded by the fact that the flies had to be packaged in Puerto Rico and stored up to 10 days prior to release. A small, single engine U-10 airc aft (Helio-Courier) further delayed release. Laboratory tests have shown decreases in longevity of adult flies corresponding to increases in holding times in the pupal stage. Delay, prior to release, is believed to have weakened the flies and limited their effectiveness.

This problem was alleviated in July 1973 when the U.S. Air Force replaced the C-123 aircraft with larger pressurized C-130 (Figure 2) as a pupae-hauling aircraft. All flies released after that time were packaged at Mission and shipped to Puerto Rico by C-130 aircraft. The C-7 (Caribou) aircraft (Figure 3) replaced the U-10 for fly distribution. The C-7 was not air-conditioned, but the flies were cooled by air circulation, since the rear of the aircraft was opened inflight to allow adequate ventilation. Routinely, flies were released at an altitude of 1,500 feet above the terrain. These measures enabled the program to release long-living and more vigorous sterile flies over Puerto Rico.

The second problem, which had to be solved after the first 2 years of fly release, was to improve the ground support activities of the program. This was accomplished by establishing a system of livestock inspections around screwworm-infested herds. Herds containing infested animals and nearby herds were sprayed with a .25% Coumaphos (Co-Ral ^{R}) spray. A total of 73,374 animals were sprayed during calendar year 1973 and 49,255 in 1974. This was opposed to only 2,987 animals sprayed during calendar years 1971-72.

This spraying was of inestimable value in helping reduce SW populations in outbreak areas and proved to be a valuable adjuvant to the sterile male technique.

SCREWWORM ERADICATION PROGRAM - PUERTO RICO

LIVESTOCK SPRAYED WITH COUMAPHOS

YEAR	NO. OF CATTLE SPRAYED BY HEAD
1971	-0-
1972	2,987
1973	73,374
1974	49,255
1975	11,300 (thru June)

Livestock inspectors equipped with Cap-Chur guns immobilized those animals which were suspected of having SW infestations. Any wounds found were treated with insecticide smears. Navels of newborn calves were also treated in this manner. On Vieques, 194 animals in 1973 were immobilized with Cap-Chur guns and treated for screwworms.

EPIDEMIOLOGY

Epidemiological investigation played an important role in the eradication of screwworms from Puerto Rico and the Virgin Islands. After the first year of sterile fly release found the Islands still infested with screwworms, entomologists and veterinarians working on the program began to suspect that screwworm flies, both sterile and fertile, finding an abundance of tropical vegetation, moisture and shade did not have to move far to find food. There were plenty of flowers growing in all areas of Puerto Rico to provide a source of nectar and pollen as food for the adult flies. This, together with the fact that there were about 225 head of livestock per square mile, many of which had wounds attractive to screwworm flies, fortified the theory that screwworm flies did not migrate as far in Puerto Rico as they did in southern Texas. This theory, though never proven, made program officials more determined to find all cases and to make sure that sterile flies were released over all areas of the island, including the most inaccessible canyons and mountains on the island. Epidemiological field studies often revealed that packs of stray dogs were causing bite wounds which helped perpetuate screwworm populations. Dogs gathered around garbage dumps in search of food. They were eliminated by a humane dog depopulation program before screwworms were finally eradicated. A single case in a horse, which went undetected and untreated for several weeks, helped to prolong the infestations in one part of the island.

The only standard regulatory technique that was not used in the Puerto Rican program was the restriction of animal movement from quarantined premises.

The third problem was that of motivating the livestock owners to cooperate with the program by inspecting their livestock and sending in larval samples. This was solved in great measure by the Extension Service in Puerto Rico. Midway in the program, program officials requested that the Extension Service take charge of the public information activities. Public information professionals of both that Service and APHIS acted quickly to accelerate the information program. They made increased use of the news media and novel ideas, such as giving a $25 reward for each larval sample submitted during the last year of the program. This accelerated information program was largely responsible for gaining improved producer cooperation during the final 2 years of the program.

Another problem, which proved troublesome, was the eradication of screwworms from Vieques. This nearby island was 20 miles long and 2 to 3 miles wide with a land area of 52 square miles. It had a population of about 7,000 people. There were more than 20,000 head of livestock on the island. A large portion of the island consisted of a restricted area used by the U.S. Navy for military training. A significant number of livestock would wander into the restricted area, where they were wounded by military explosion and residue of paraphernalia used in training. These animals were a constant source of SW infestation and, ultimately, had to be rounded up with helicopters for inspection and treatment. Helicopters were used because of the numerous unexploded shells in the shell impact area, which made it unsafe for personnel to enter. After the animals were removed from the impact area, the fence surrounding the impact area was repaired constantly to prevent livestock from reentering.

The importance of good epidemiological field work must be ever kept in mind in any attempt to eradicate screwworms from a given area.

CONCLUSIONS

The sterile male technique was chiefly responsible for the eradication of SW from Puerto Rico and the Virgin Islands. The technique is a vigorous program dependent on effective ground support, which includes conventional methods of animal disease eradication, such as, inspection of livestock, collection and submission of larval samples, spraying of affected animals witn an approved pesticide, good epidemiology, and a vigorous public information and educational program to enlist the cooperation of the livestock owner.

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